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Salina Spiering

Transformative science methods – the human scale development approach revisited

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Transformative Science Methods –

the Human Scale Development approach revisited

Salina Spiering

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Transformative Science Methods – the Human Scale Development approach revisited

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Salina Spiering, geb. Centgraf,

geboren in Stuttgart

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Dekan:	Prof. Dr. Dr. h.c. Norbert Hölzel
Erstgutachter:	Prof. Dr. Paul Reuber
Zweitgutachterin:	Dr. Heidi Wittmer
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Abstract | English Version

There is widespread agreement within sustainability science that a radical sustainability transformation is needed to address the many crises ranging from climate change and biodiversity loss to growing inequality and poverty. To turn the current unsustainable developments into a transformation towards sustainability, the notion of transformative change is gaining momentum. The IPBES Global assessment defines transformative change as a fundamental change process in which technological, economic, and social issues are thought about and made radically differently than before.

In this context, the debate is increasingly focusing on the responsibility of science and its role in promoting transformative change. Purely 'top-down' measures, or incremental steps are proving to be insufficient. Some are calling for a new cooperation between science and society, from which solutions can emerge 'bottom-up', allowing the Sustainable Development Goals and the Paris Agreement to be achieved. A new research paradigm, propagated since 2016 is that of 'transformative science'. This approach is normatively oriented towards the provision and development of solutions for sustainable social change, and simultaneously pursues scientific, practical and educational objectives, with the explicit goal of transforming the science system. The question is not only what science needs to do differently to support transformative change to sustainability, but also how it can contribute to supporting such changes.

The main aim of this dissertation is to contribute to the advancement of transformative science, in particular deriving a set of quality criteria to assess how methods and approaches can encourage transformative change to sustainability. As such, the thesis focuses on methods of transformative science and contributes to a better understanding of how transformative science can be consistently underpinned by empirical methods.

The dissertation proposes answers to the following questions: What makes a scientific method transformative or at least adequate for being employed in transformative science settings? What are appropriate criteria to measure their quality? How can empirical methods be designed or adapted for bottom-up transformative science? How can change agents be supported by transformative science? What added value is provided by a self-reflexive practice of transformative science scholars whose research is situated between science and practice?

As its main contribution, the thesis develops an analytical framework for assessing the quality of transformative science methods, which encompasses the stated objectives in combination with basic normative assumptions and key characteristics of this research approach. Using the example of the "Human Scale Development approach" (HSDA) by the Chilean economist Manfred Max-Neef and his colleagues, which was initially designed and used as tool for Latin-American communities to take development issues into their own hands, the dissertation shows how an already existing method has been adapted for transformative science to generate action-oriented transformation knowledge in addition to analytical knowledge, while at the same time fulfilling the necessary quality criteria.

Specifically, the thesis shows how the methodological and theoretical potential of the HSDA can be used to support 'agents of change' as drivers of sustainability transformation processes in the context of transformative science. By means of different case studies in energy initiatives in Chile and Germany, the dissertation outlines that considering the human dimensions (by applying the HSDA in ten different workshop settings) and linking needs to sustainability opens up new perspectives on possible development paths. A case study of German renewable

energy cooperatives is presented in detail to show how the HSDA could contribute to generating systems knowledge, target knowledge and transformation knowledge necessary for transformative change. The analysis of the HSDA serves as an example, indicating how other methods could be adapted for transformative knowledge co-production, and the proposed analytical framework could be used to check how they meet quality criteria.
In a further step, the thesis changes perspective and turns to the role and the related necessary competencies of the researcher within transformative science. In turn, the HSDA is proposed as a tool for an autoethnographically sensitive, self-reflexive practice, which is acutely aware of the distribution of power and thereby takes a feminist stance. As a result of this reflection, the thesis identifies both endogenous and exogenous factors that are understood as indispensable for transformative science.

The thesis concludes that in order to meaningfully implement transformative science, it is necessary to recognize new roles and competencies that go beyond the classic understanding of top-down science, as 'acting objectively, generating descriptive-analytical knowledge'. Instead the additional aim of co-creating actionable knowledge is corroborated and the quality of its knowledge production processes can be meaningfully ensured by testing it with the criteria presented in the analytical framework. As a second main contribution the thesis provides empirical knowledge and concludes by presenting the added value of the HSDA as a method for TSc, namely that it links needs and sustainability, contributes to a democratization of knowledge, serves as tool to support agents of change, and serves as tool for (self-)reflexive practice.

Zusammenfassung | 'Abstract' German Version

In den Nachhaltigkeitswissenschaften herrscht große Übereinstimmung, dass es dringend eine radikale Nachhaltigkeitstransformation braucht, um die derzeitigen zahlreichen Krisen zu bewältigen, die vom Klimawandel über den Verlust der biologischen Vielfalt bis hin zu wachsender Ungleichheit und Armut reichen. Dabei gewinnt das Konzept des „transformativen Wandels" als Antwort auf aktuelle nicht-nachhaltige Entwicklungen zunehmend an Bedeutung. Der globale Rahmen von IPBES definiert transformativen Wandel als einen grundlegenden Veränderungsprozess, bei dem technologische, wirtschaftliche und soziale Fragen radikal anders gedacht werden als bisher und das (politische) Handeln entsprechend ausgerichtet ist.

In diesem Zusammenhang konzentriert sich die Debatte zunehmend auch auf die gesellschaftliche Verantwortung der Wissenschaft und ihre Rolle bei der Förderung dieses transformativen Wandels. Es wird argumentiert, dass es einer Transformation des Wissenschaftssystems, seiner Methoden und Qualitätsmessungen bedarf, um den transformativen Wandel umfassend zu unterstützen. Rein „von oben" verordnete Maßnahmen stellen sich als ungenügend oder obsolet heraus und es wird vermehrt eine neue Zusammenarbeit von Wissenschaft und Gesellschaft gefordert, aus der Lösungsansätze „von unten" hervorgehen um die Pariser Nachhaltigkeitsziele umzusetzen.

Ein Forschungsparadigma das sich seit 2016 etabliert, ist das der „Transformativen Wissenschaft". Dieser Ansatz ist normativ auf die Bereitstellung und Entwicklung von Lösungen für einen nachhaltigen gesellschaftlichen Wandel ausgerichtet und verfolgt dabei im Sinne einer Umgestaltung des Wissenschaftssystems gleichzeitig wissenschaftliche, praktische und edukative Ziele. Aufgrund der praktischen Erweiterung von „konventioneller" Forschung erfordern diese Ziele weitergehende Kriterien zur Überprüfung ihrer wissenschaftlichen Qualität.
Die vorliegende Arbeit fokussiert auf Methoden Transformativer Wissenschaft und schlägt Antworten auf die Frage vor, welchen Zielen diese Art der Forschung dient, wie Methoden für Transformative Wissenschaft gestaltet sein können und wie entsprechende Kriterien zur Messung ihrer Qualität aussehen können. Dabei entwickelt die Arbeit einen Analyserahmen zur Qualitätsmessung von Methoden Transformativer Wissenschaft, der eine Kombination aus den genannten Zielen mit normativen Grundannahmen und Hauptcharakteristika dieses Forschungsansinnens umfasst. Anhand des Beispiels des „Ansatzes zur Entwicklung nach menschlichem Maß" (HSDA) des Chilenischen Ökonomen Manfred Max-Neef und seinen Kollegen, das ursprünglich als Entwicklungsinstrument für ländliche Gemeinden diente, zeigt die Arbeit, wie eine bereits existierende Methode so angepasst werden kann, dass sie zusätzlich zu analytischem auch aktionsorientiertes Transformationswissen zu generieren vermag und gleichzeitig die erforderlichen Qualitätskriterien erfüllt. Die Arbeit stellt dar, wie sein methodisches und theoretisches Potential nutzbar gemacht werden kann, um sogenannte Akteure des Wandels als Treiber von Nachhaltigkeitstransformationsprozessen durch Transformative Wissenschaft zu unterstützen. Die Analyse des HSDA dient als Beispiel, um auch andere Methoden für Transformative Wissenschaft anzupassen und mit Hilfe des vorgeschlagenen Analyserahmens auf ihre Qualität hin zu überprüfen.

Anhand verschiedener Fallstudien von Energieinitiativen in Chile und Deutschland wird in der Dissertation aufgezeigt, dass die Berücksichtigung der menschlichen Dimensionen (durch Anwendung des HSDA-Ansatzes in 10 verschiedenen Workshop-Settings) neue Perspektiven auf mögliche Entwicklungspfade eröffnet. Zur Illustration wird in einer Fallstudie mit deutschen Energiegenossenschaften detailliert vorgeführt, wie der HSDA-Ansatz genutzt werden kann, um System-, Ziel- und Transformationswissen zu generieren, das für einen transformativen Wandel notwendig ist und längerfristig die Resilienz dieser Initiativen fördert.

In einem weiteren Schritt vollzieht die Arbeit einen Perspektivwechsel und wendet sich der Rolle und den damit zusammenhängenden notwendigen Kompetenzen der Forscherin innerhalb Transformativer Wissenschaft zu. Hierzu wird der HSDA als Instrument für eine autoethnografische, selbstreflexive Praxis vorgeschlagen, die sich der Verteilung von Macht bewusst ist und eine feministische Haltung einnimmt. Als Ergebnis dieser Reflexion leitet die Arbeit sowohl endogene als auch exogene Faktoren ab, die als Implikationen für Transformative Wissenschaft verstanden werden.

Die Dissertation kommt zu dem Schluss, dass es für eine sinnvolle Umsetzung der Transformativen Wissenschaft notwendig ist, neue Rollen und Kompetenzen anzuerkennen, die über das klassische Verständnis von Top-down-Wissenschaft als "objektiv handelnd, deskriptiv-analytisches Wissen generierend" hinausgehen. Stattdessen wird das zusätzliche Ziel der Ko-Kreation von aktionsorientiertem Wissen bekräftigt. Die Qualität dieser Wissensproduktionsprozesse kann durch eine Prüfung anhand der im analytischen Rahmen vorgegebenen Kriterien sinnvoll sichergestellt werden.

Als zweiten Hauptbeitrag liefert die Arbeit empirisches Wissen und stellt abschließend den Mehrwert des HSDA als Methode für Transformative Wissenschaft dar, indem er Bedürfnisse und Nachhaltigkeit verbindet, zu einer Demokratisierung des Wissens beiträgt, als Instrument zur Unterstützung von Akteuren des Wandels sowie als Werkzeug für eine (selbst-)reflexive Praxis dient.

List of Articles

The following articles in journals with double-blind peer review procedures are the core components of this cumulative dissertation:

Spiering S (2022): Self-reflexive practice through the Human Scale Development approach — competencies needed for transformative science research. Special Issue on: "Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work". I*nternational Journal of Sustainable Development*, Vol. 25, Nos. 1/2, 2022.
https://doi.org/10.1504/IJSD.2022.10049718
*(ISI-listed journal; within the thesis presented as **article 5**)*

Spiering S and Barrera MdV (2021): Testing the quality of transformative science methods: the example of the Human Scale Development approach. *Sustain Sci.*
https://doi.org/10.1007/s11625-021-00966-3
*(ISI-listed journal; within the thesis presented as **article 1**)*

Centgraf[1] S (2018a): Supporting civic engagement in German energy cooperatives — Transdisciplinary research based on the reflection of individual needs. *Energy Research & Social Science* 44, 10/2018, 112–121.
https://doi.org/10.1016/j.erss.2018.05.003
*(ISI-listed journal; within the thesis presented as **article 4**)*

Masson T, **Centgraf S** and Rauschmayer F (2015): Mitglieder-Zuwachspotenzial für Energiegenossenschaften in Deutschland? *Zeitschrift für das gesamte Genossenschaftswesen* 65, 191–208.
https://doi.org/doi:10.1515/zfgg-2015-0304
*(within the thesis presented as **article 3**)*

Article that complements the dissertation:

Spiering S and Barrera MdV (2020): How to?! Practical knowledge for transformative science — facilitation guidelines for two applications of the Human Scale Development approach. *UFZ Discussion Papers*, 3/2020. Leipzig: Helmholtz-Zentrum für Umweltforschung – UFZ, ISSN 1436-140X
https://doi.org/10.57699/a3y9-gd49
*(within the thesis presented as **article 2**)*

The ideas and arguments published in these articles are summarized and brought together in this publication. Those sections of the text that are based on one of the above publications are identified as such by references in the footnotes.

[1] I got married in August 2018, as a consequence my name changed from Centgraf to Spiering
https://orcid.org/0000-0003-0860-1129

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1 Introduction Science for transformative change

"Our world as we know it and the future we want are at risk. Despite considerable efforts these past four years, we are not on track to achieve the Sustainable Development Goals by 2030. We must dramatically step up the pace of implementation as we enter a decisive decade for people and the planet. We must connect the dots across all that we do — as individuals, civic groups, corporations, municipalities and Member States of the United Nations — and truly embrace the principles of inclusion and sustainability.

Science is our great ally in the efforts to achieve the Goals."

Antonio Guterres, Independent Group of Scientists appointed by the Secretary-General (2019:xi)

"Our beautiful Earth is becoming inhospitable to us. How should educators, researchers, and knowledge creators respond to this existential threat? By accepting an unpalatable truth: our mainstream approach to learning, education, and research is actively co-producing the very opposite of what we need at this time of unsustainability."

Bradbury et al. (2019: 3)

"Rather than attempting to produce specific solutions or transformation strategies, we might primarily need to overcome paralysis and encourage creativity, empowerment, solidarity, and thereby agency. This implies that as experts and knowledge brokers we might rather want to promote capabilities […] to on the one hand radically rethink a society that is based on endless growth, consumerism, and inequality, and to on the other hand experiment with manifold locally-rooted potential solutions.

Kueffer et al. (2019: 388)

It is increasingly acknowledged that incremental steps to address current sustainability challenges are failing to reach the Sustainable Development Goals and instead a radical change is needed that is truly transformative (Haberl et al. 2011, Kates et al. 2012, IBPES 2019). Transformative science (TSc) as a fairly new paradigm within sustainability science aims at taking responsibility for social developments and contributing to address current and pressing sustainability challenges by research deliberatively co-produced together with social actors (Schneidewind et al. 2016, Singer-Brodowski et al. 2021). However, TSc as a theoretically grounded paradigm for the transformation of certain aspects of the science system is at a developmental stage (Jaeger-Erben et al. 2018) and under criticism due to its practical orientation (Strohschneider 2014, Grunwald 2018, Meisch 2019). Much of the research on TSc up to now has been focussing on a theoretical debate and there is a lack of more rigorous systematization and an empirical TSc research practice that is methodologically and theoretically sound. TSc's claim to play a moderating and co-creating role in the development of a sustainable society, and to create transparency about its own assumptions and positioning, is not yet well enough translated into practice (Jaeger-Erben et al. 2018, Blythe et al. 2018).

Thus, the main aim of this thesis is to contribute to the advancement of practical action-oriented TSc research by developing quality criteria for selecting and adapting adequate methods. I aim to investigate on a theoretical-conceptual level how to test the fit of methods as TSc methods and how to thus ensure the scientific quality of this research; enhancing agency and involving society is at the centre of sustainability transformations and of the need to co-create solutions together with societal actors. Rather than reinventing the wheel, it seems sensible to revisit approaches that have been developed to support agency, such as the Human Scale Development approach (HSDA) of Manfred-Max Neef et al. (1991) that was designed and used as a tool for Latin American communities in the 1980´s to take development issues into their own hands. I intend to exemplarily examine the HSDA to see whether it is suitable as a TSc method and how it may need to be adapted to generate different types of knowledge necessary for transformative change to sustainability.

This chapter provides an introduction to and overview of the dissertation project by first discussing the research problem, the research aims, objectives and questions, as well as the significance, followed by the background and context, and finally, its structure.

1.1 Problem description – humanity is not succeeding in implementing sustainable development

Need for transformative change to tackle "super-wicked" problems

Within sustainability science the urgent need to radically transform the current unsustainable technological, economic and social systems to guarantee (human) life on earth is repeatedly emphasized (Wiek et al. 2012, Blythe et al. 2018, Köhler et al. 2019, Díaz et el. 2019, Wittmer et al. 2021, Bentz et al. 2022). Sustainability challenges including, but not limited to, biodiversity loss, the degradation of ecosystems, climate change, food insecurity, inequality, crises of democracy and poverty are increasingly perceived as interconnected "super-wicked" problems (Levin et al. 2012, Peters and Tarpey 2019). The mutually dependent and reinforcing tendencies of these problems have severe implications for nature and for people´s livelihoods and quality of life, locally and globally (Pandit et al. 2021). At the same time, socially, politically, economically, or culturally marginalized people disproportionately feel their negative effects (ibid: 7).

With the adoption of the resolution "Transforming our World: the 2030 Agenda for Sustainable Development" (United Nations 2015) the General Assembly of the United Nations (UN) launched seventeen integrated and indivisible Sustainable Development Goals (SDGs) based on five values (the "5 Ps": People, Planet, Prosperity, Peace, and Partnership) and 169 targets for "transforming our world for the better" in ways that are socially inclusive and equitable. The aim was to provide an ambitious and comprehensive guide for policymakers that would allow better integration across sectors than achieved under their predecessors and was praised as a "blueprint for a better future" (Ban 2016).

These SDGs by some are criticized for being too complex to communicate to the public or drive policy (Livermann 2018: 178), while other authors find fault with the targets and indicators that reduce the transformative potential of the SDGs by favouring economic growth over sustainable resource use (Eisenmenger et al. 2020, Robra and Heikkurinen 2019). Kapto (2019) condemns how the policy process of goal development ended up as a very technical process of indicator development. Despite the lamented limited transformative potential of the SDGs, from an analytical perspective, it is stressed that the SDGs provide the most purposeful compilation of targeted ambitions for policy makers agreed upon so far and as such they inhere a strategic relevance to unite science, industry and civil society to enhance mutually reinforcing actions for sustainable development (Langford 2016, Eisenmenger et al. 2020).

Together with the SDGs, the notion of 'transformation' has gained momentum: "The 2030 Agenda for Sustainable Development calls for transformative goals, targets, and visions, and suggests that achieving these ambitious aims will require 'structural transformation'" (United Nations 2015: 11). This call for transformation is based on the insight that incremental adaptations no longer suffice, since humanity is currently not on track to actually achieve the SDGs (Pokorny et al. 2019: xx, UN Environment 2019). Instead, radical transformations are needed

(Blythe et al. 2018: 1207). The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IBPES) provides a definition of such radical transformative change: **"Transformative change is a fundamental, system-wide reorganization across technological, economic and social factors, including paradigms, goals and values. […]. Transformative change builds on a deliberate process that challenges and shifts routine values and practices, in contrast to merely incremental changes. The scale and durability of such transformations, as well as whether or not they will be positive, remains difficult to predict"** (IPBES 2019: XVIII). Such a comprehensive transformation can neither be imposed from above nor planned in advance; rather, its nature is experimental, open-ended and will most likely take place in a series of small and at the same time radical steps. In order to support these steps to unfold an impact towards sustainability transformation, it is promising to follow a clear vision (GEO 2019: 582, Wittmer et al. 2021).

Despite the knowledge about the urgency to take rapid, far-reaching and unprecedented action by different actors on numerous scales (IPBES 2021: 32), there is a discrepancy between such knowledge and action. Adequate and immediate reactions to protect the environment, and as such our livelihoods, are lacking (Vogt and Weber 2021, United Nations Environment Programme 2021). In this context, the responsibility of science is increasingly coming into focus in the debate (Vogt and Weber 2020): On the one hand, individual scientists are asked to take responsibility for the social and ecological consequences of their own research (Singer-Brodowski et al. 2021: 347). On the other hand, universities are urged to recognize their societal responsibility as an essential feature of their own activities. This raises the question of the role of science in transformative change. I will further elaborate on this question in the following section.

1.2 What kind of science is needed for transformative change?

> "Science will be one of the most critical means of implementation for the Agenda 2030", and "Science is a driver and enabler of inclusive and people-centered sustainable development"
>
> Scientific Advisory Board (2016: 3)

Science plays a fundamental role in creating the knowledge that is used in modern societies. It is therefore expected to provide the knowledge needed for transformative change and considered an important lever for bringing about such change. In context-dependent combinations with other levers such as 1. governance, 2. the economy and finance, 3. individual and collective action and 4. technology, scientists can promote transformation by providing or jointly producing the respective, best suitable knowledge needed (Independent Group of Scientists appointed by the Secretary-General 2019: xxi). To be transformative, these levers, including science, should be "holistic" and as such broadly defined (UN Environment 2019: 582). The Independent Group of Scientists appointed by the Secretary-General (2019: xxxii) state accordingly: "The urgent need for sustainable transformations requires strengthening the directionality of science on behalf of a mutually beneficial 'moon landing' for humanity and the Earth. Researchers, science policymakers and funding agencies can use the 2030 Agenda as a shared compass to increase the relevance and benefits of science and technology for the global community". Hence, the 2030 Agenda assigns a new role to science, and its ontologies, practices, funding schemes and methods need to be adapted if they are to help achieve the sustainability vision set out in the 2030 Agenda (Schneider et al. 2019). Already in 2013, the global network of Future Earth (2013) called into question top-down approaches to knowledge production: the "model of knowledge production, where knowledge is normally produced by academia and then applied in society to address major societal challenges for the future, has shown major limitations" (IPBES 2021: 153). Most scholars in the field of sustainability sciences agree, that transformations to sustainability require considerable adjustments of societal objectives (Fazey et al. 2018, Köhler et al. 2019, Schneider et al. 2019), as well as changes of individual mindsets and practices (Göpel 2016, Wamsler et al. 2020, Woiwode et al. 2021). In other words, societies across the globe need to develop new individual and collective strategies on how to satisfy human needs within planetary boundaries, enabling a life in dignity for all. UNEP states in this regard that "transformations do not necessarily result from top-down approaches. They emerge from the co-evolution of multiple interdependent factors and the active engagement of diverse stakeholders" (UN Environment 2019: 582). To shape disruptive transformation processes, science-policy relationships need to consider a wide range of different political and cultural contexts. Science needs more and different deliberative, bottom-up approaches to produce practical/actionable/solution-oriented/transformative knowledge (Brandt et al. 2013, IPBES 2021, UN Environment 2019, Kehrer et al. 2020).

In recent years, the emerging perspective of "transformation research" has become an umbrella for a variety of research approaches aimed at producing knowledge that can contribute to environmental sustainability, poverty alleviation and social justice (Wittmayer et al. 2018). Human geography plays an important role in this debate and contributes to the politicization of transformation as it discusses questions of agency (Cameron et al. 2015),

issues of power and authority (Braun 2015), as well as political decisions (Pelling et al. 2015, O´Brien 2018). With the 'transformative turn in sustainability science' (Blythe et al. 2018) the European and in particular the German debate on sustainability sciences, postulates the need for a paradigm shift to achieve sustainable development, and calls this transformative science (TSc) (Schneidewind 2016). The main concern of TSc is to create not only descriptive-analytical knowledge, but complementary actionable knowledge for sustainability transformations. Its three main constituents are transformative research, transformative literacy and institutional change (Singer-Brodowski et al. 2021). It explicitly follows normative goals and aims to deliberately incorporate values (i.e. sustainable development) to guide science both in terms of research and in terms of scientific institutions.

So far, the debate on TSc has been primarily a theoretical one; TSc's practice orientation encounters skepticism and reluctance and this criticism has been fed by theoretical arguments (Strohschneider 2014, Schneidewind 2015, Grunwald 2018): its approaches are perceived as "secular" (Mittelstraß 2018), as focusing too much on concrete practical solutions while lacking a descriptive, objective character and scientific legitimacy. To respond to this criticism, it needs more rigorous systematization and a clearer understanding of how scientific quality standards can be combined with pursuing normative goals (Defila and DiGiulio 2018, 2019). The action orientation in TSc research processes requires e.g. that criteria such as reflexivity or self-reflexivity become more important so that researchers can examine the different roles they take on. Despite the need postulated by various scholars, few quality criteria have been described and defined specifically for TSc. TSc methods tested by comprehensible quality criteria could help to (1) promote recognition of co-produced knowledge among 'traditional' scientists, (2) pave the way for a debate on how they can contribute to transparency and credibility of co-produced knowledge, and (3) support research practice that would benefit from a TSc canon of methods with proven quality (Wiek and Lang 2016, Stelzer et al. 2018, Defila and DiGiulio 2018).

An empirical TSc research practice is in a development stage, is experimental and needs places and settings in which its impact on society and science can be tested, as an important step towards developing approaches that are methodologically and theoretically sound. Until now, TSc's mainly systemic approach has not considered the individual level; this deficiency should and — I believe — can be overcome in order to make it more relevant to transformation. Therefore, a clarification of its main aims, methodological quality characteristics and epistemologies is needed (Dedeuwaerde 2014). In its critical questioning of power positions, and its striving to change power relations inherent in the science system, TSc shows remarkable similarities to feminist research and can learn from and be inspired by the approaches and arguments developed in this field (Fonow and Cook 1991, England 1994, Harding 2017, Vogelpohl AFGA 2021).

Following the argument that top-down approaches do not suffice to catalyze change towards sustainability, and that deliberative bottom-up approaches are urgently needed, the main aim of this dissertation is to contribute to the advancement of action-oriented TSc. In order to do this, I investigate how to a) derive a set of criteria to assess how methods and approaches can be applied in the context of TSc and b) further develop a method for sound empirical TSc research that is able to combine the individual and the system level perspective for achieving transformative change. More precisely, I revisit the needs-based Human Scale Development approach (HSDA) that has been presented by the Chilean economist Manfred Max-Neef and his colleagues (1991) which I assume is particularly well suited as a TSc method. I investigate how to adapt the HSDA as an empirical method for TSc to apply it in different empirical settings with energy initiatives and analyze how it contributes to the objectives of TSc.

1.3 Testing the Human Scale Development approach as method for transformative science

With regard to the argument above that societies across the globe need to develop new individual and collective strategies on how to satisfy human needs in order to enable transformative change, the HSDA seems to be a promising approach, as its core is to enable a broader perspective on meeting human needs. At the same time, HSDA was not developed as a scientific approach, but as an analytical tool and community development approach in the Global South. Therefore, the thesis aims to investigate which requirements the HSDA has to fulfill in order to make it usable for TSc, which requirements it already fulfills and where it needs to be adapted (e.g. for more action orientation).

The HSDA was first presented in an article published by the Dag Hammarskjöld Foundation (DHF) in 1986 (Max-Neef et al. 1986, 1989). It had been developed as an alternative conception of development beyond economic growth and is firmly committed to a people-centered approach, based on human well-being. In the late 1980s and early 1990s, the HSDA initially pursued the goal of supporting Latin American grassroots movements in identifying their own objectives of development. The approach turned out to be successful as an alternative where top-down development strategies had failed, and Max-Neef liked to present his work as "one of the most photocopied documents of its kind" (Max-Neef et al. 1989: 1). The HSDA is inspired by humanistic economics, which stress the recovery of human dignity and equity. The HSDA provides both a theory on human needs, with a focus on problems affecting humanity as a whole, and a practical methodological outline to empower and revitalize small and medium-sized urban and rural communities. The pillars of the HSDA are the satisfaction of so called fundamental human needs (FHN) and the ability of groups to increase their levels of self-reliance. The conviction on which this theory is based is that development is about people, and that well-being arises when people are able to satisfy their FHNs. With its participatory methodology the HSDA provides an evaluation tool to analyze how well a community is functioning regarding the well-being of its members. It serves as an analytical tool for workshop participants to reflect on factors that a) prevent development in which their needs are not met, and b) factors that enable development in which their needs are met, or c) that will enable them to meet their needs in the future. Thereby, it offers entry points for improved self-reliance through alternative development paths, by giving a holistic view of both: deprivations and potentials of a given community.

The approach thus seems to make it possible to capture essential elements that are necessary for the transformation towards a sustainable society. In 1987, the United Nations Brundtland Commission defined sustainability as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987). Jolibert et al. (2014: 46) have argued that "[t]he needs-based approach gives new meaning to the Brundtland report's definition of sustainable development in which needs are central to consensus, and where we have to recognize and accept our shared values but also accept the judgement of our actions by future generations". The question arises how this new meaning can be implemented so as to serve transformation. While there are various methods that can probably be made usable for TSc (Wiek 2016), I am not aware of any that lays emphasis on reflection about human needs center stage in the way HSDA does. I am convinced

that such reflection could substantially enhance the co-production of potential evidence-based solutions. HSDA allows to combine a bottom-up perspective with changes within a system and could therefore contribute to combine systemic and individual perspectives on sustainable development and thus may add value to TSc. Consequently, I will investigate and test how the HSDA with its alleged link between needs and sustainability, can serve as a method for empirical TSc research.

To illustrate what an adaptation, testing and reflexive practice of methods within TSc could look like, I subject the HSDA to a critical review. General methodological guidelines for TSc research call for 1) a combination of diverse methodological frameworks (descriptive-analytical as well as transformative) to generate actionable knowledge, 2) collaboration and co-production with diverse stakeholders, and 3) a contribution to the generation of three different types of knowledge (Lys 1997, Lang et al. 2012, Wiek and Lang 2016). These consist of systems knowledge (which is needed to understand an issue, its dynamics and causal influences), target knowledge (about the desired future state of the system and why this state is desired), and transformation knowledge (about the available ways and means of realizing the desired state of the system in practice) (Grunwald 2007, Hadorn et al. 2008, Gaziulusoy and Boyle 2013). I seek to test whether the HSDA fulfills these guidelines or whether and how it can be adapted accordingly.

1.4 Research question and structure of the thesis

As TSc is seen as an important lever to reach transformative change towards sustainability, it needs methods that are able to contribute to the co-production of descriptive-analytical and actionable knowledge alike (Fazey et al. 2018, Parodi et al. 2019). Building on this argument, the overall aim of this thesis is to contribute to the advancement of action-oriented TSc, with particular regard to achieving a better understanding of how TSc can catalyze urgently needed transformative change towards sustainability. I endeavor to fill gaps regarding quality criteria for normatively inspired action-oriented research, and I want to propose an example of how to adapt methods to fulfill the quality criteria and to actively support agents of change. To finish off, I aim to suggest a self-reflexive practice for researchers within TSc.

My underlying assumptions here are that needs fulfillment is a means of achieving sustainable development, and that the HSDA as an individual and systemic approach with its particular focus on needs can serve as a method for TSc to produce actionable knowledge for sustainability transformations. I examine the HSDA as a valuable approach that can enrich TSc research practices. The overarching research question addressed throughout this examination of the HSDA is:

How can action-oriented transformative science and its inclusive and deliberative methods be advanced to support transformative change?

This entails the following sub-questions:

- What makes a scientific method transformative or at least adequate for being employed in TSc settings? What are appropriate criteria to measure their quality? (see chapter 2)

- How can empirical methods be designed or adapted for bottom-up TSc? (see chapter 2 & 3)
- How can change agents be supported by TSc? (see chapter 4)
- What added value is provided by a self-reflexive practice of TSc scholars whose research is situated between science and practice? (see chapter 5)

The present thesis appears in cumulative form and consists of five scientific publications in the field of sustainability science (see list of articles above). Four of the articles have undergone a double-blind peer review process in national and international journals. The fifth article, Spiering and Barrera (2020), was published as a Discussion Paper of the Helmholtz Centre for Environmental Research in Leipzig (UFZ). The UFZ Discussion Papers are part of a series dedicated to the publication of current results and discussions taken from ongoing work in the field of environmental science. The main aim of the series is to make detailed case descriptions, notes on methodologies and research designs, political reports and other practice-oriented scientific work available in a transparent manner. The papers in the series undergo an internal review process, and colleagues from scientific research as well as experts from practice are invited to share their thoughts and experiences.

Part of the research is based on a project on German energy cooperatives, "EnGeno: transformation potentials of energy cooperatives" (project term 2013–2016, funded by the German Federal Ministry of Education and Research), of which the Department for Environmental Politics at the UFZ was an affiliated partner (Lautermann et al. 2017). In view of the — at the time — still very new subject matter, the transdisciplinary project investigated how energy cooperatives as organizations contributed to the transformation of the German energy system. It also looked at how the individual members behaved and how cooperatives and members could be strengthened in their transformative efforts. As part of EnGeno, I conducted a quantitative questionnaire study among members (Holstenkamp et al. 2018) and non-members of German energy cooperatives (Masson et al. 2015). These quantitative surveys served as an initial exploratory approach, understanding the role of German energy cooperatives as change agents within the German energy transition.

The dissertation project, conducted full time since November 2016, was interrupted by parental leave. The relatively long processing time offered unexpected opportunities for the project, allowing a longer-term empirical observation of dynamic processes within the energy cooperatives. Meanwhile, the theoretical and conceptual development of the new scientific paradigm around TSc gained momentum, opening somewhat new perspectives for my research trajectory.

Within the framework of EnGeno, I conducted three HSDA workshops with three different German energy cooperatives. The workshops were framed by semi-structured guided interviews with four participants per workshop, shortly before and one to three months after the workshops. The results of this case study were published in Centgraf (2018). Within EnGeno, I conducted another workshop with three further energy cooperatives and a transition town initiative in the same region. When funding within the EnGeno project ran out, I was grateful to be granted a scholarship from the Friedrich-Ebert-Stiftung for 48 months. During this period, I conducted six additional workshops in different settings (see section 3 for details). All the analyses in this dissertation with their different methodological aspects draw on twenty-four semi-structured interviews, workshop observation protocols, entries in research diaries, and the detailed reports on the discussions, results and processes in ten HSDA workshops.

This dissertation project was conducted in a 'hybrid' space between a university setting and a research center for applied science. The 'realm' of the Institute for Geography at the University of Münster mainly supported conceptual and theoretical aspects of this thesis. In addition, critical feminist reflections and autoethnographic considerations had an impact on the theoretical foundations of this work. The advantage of conducting empirical research under the auspices (and thus in the 'realm') of the UFZ as an application-oriented scientific institute was that it allowed practical implementations of the methods developed. I was able to test knowledge in practice, refine it, and feed it back into science and practice equally. In terms of research on knowledge transfer, this dissertation project was able to further develop and test a method for bottom-up empirical research and reflect its strengths and weaknesses in a setting of intense interaction between science, private industry, civil society and politics. Beyond the specific empirical contributions, it aims at general knowledge regarding the design of methods for TSc by developing a framework for assessing their quality and thus contributes to conflict knowledge and sustainability governance.

The line of argument of this dissertation framework follows a linear logic and is presented in a 'conventional' IMRAD structure (introduction, methods, results and discussion). However, the different articles were not published in the linear order of this structure, due to the iterative research process called for by the overall framework of this work. As already mentioned, the "transformative turn" within sustainability science took place parallel to the research for this thesis and influenced it accordingly (Blythe et al. 2018).

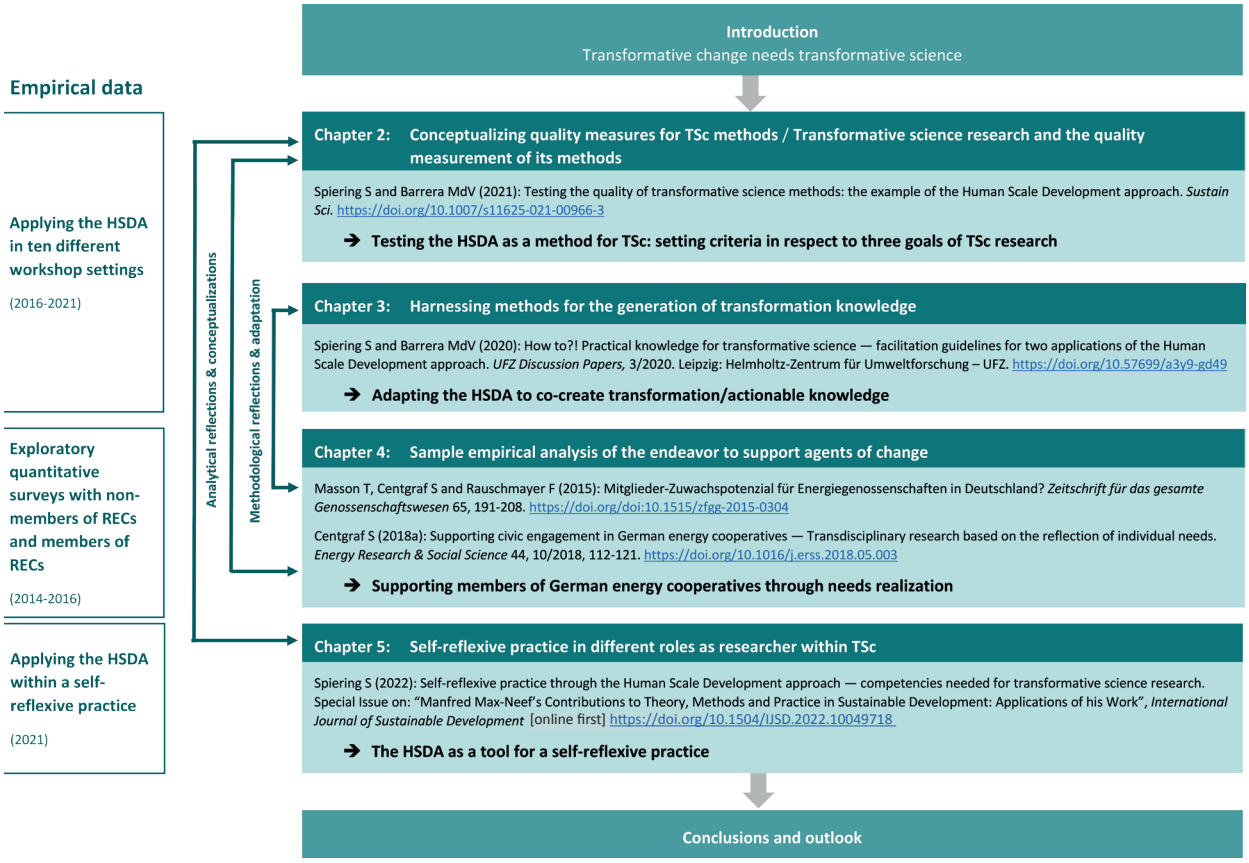

Figure 1: Outline and structure of the thesis

The second chapter (based on article 1) is a conceptual one and focuses on relevant aspects with respect to the quality assessments of TSc methods. It first introduces TSc, its objectives and questions, and contextualizes it in relation to other research approaches in the field of transformation research. The main purpose of the chapter is to provide a framework to assess requirements for and the quality of TSc methods. The framework underpins three main objectives of TSc (scientific, practical and educational) with different types of knowledge and quality requirements for normatively oriented science on transformation discussed in the literature. Next, I use this framework to analyze the HSDA and discuss conceptually why and how the needs-based approach of the HSDA adds value to the TSc methods canon. Because this chapter introduces the major theories and underlying concepts, it is more detailed and broader in scope than the other chapters of the thesis.

In Chapters 3, 4 and 5 further, I start every chapter by focusing on TSc and then underpin my argument with examples in the second part of each chapter, presenting the insights gained by applying the HSDA as a TSc method. The third chapter (based on article 2) shows how value-driven bottom-up approaches that add practical knowledge, both productive "how-to" knowledge and practical wisdom (Aristotle (2004) called them technē and phrónêsis) help to advance TSc methods and to create transformation knowledge. The summary of article 2 presents adaptations of the HSDA methodology, which enable the workshop participants to gain transformation knowledge and provides detailed facilitation guidelines in three languages.

Chapter 4 comprises two articles detailing empirical experiences of applying the HSDA in different case studies. Section 4.1 (based on article 3) introduces the field of German energy cooperatives and discusses their transformative potential as agents of change in the German energy transition. Section 4.2 (based on article 4) builds on the previous one and describes three case studies where the civic engagement of members of energy cooperatives was successfully supported by applying the HSDA framework.
Chapter 5 takes up reflexivity and identifies values underlying higher education and discusses how they might and should be altered to make TSc more successful in its quest for sustainability. I therefore zoom in on the role of the researcher as a very important factor within TSc research. The chapter emphasizes the often-claimed need for (self-)reflexive practice within transformation research, and I argue that TSc could take inspiration from autoethnographic and action research in order to institutionalize (self-)reflexive practices among individual researchers and within research teams. In the summary of article 5, I present the HSDA as a tool for such a self-reflexive practice, and conclude by enumerating necessary competencies and other factors that will improve such self-reflexive practices.

Summaries of the individual articles are inserted as boxes at the end of chapters 2 to 5 to integrate them into the line of argument of this dissertation framework. A synthesizing discussion in chapter 6 brings together the central results and arguments of all the strands, outlines the topics addressed by this thesis, and highlights topics that would merit further consideration.

2 CONCEPTUALIZING QUALITY MEASURES FOR TRANSFORMATIVE SCIENCE METHODS

The aim of this chapter[2] is to introduce TSc with its methods and gaps on a theoretical-conceptual level. To this end, I first briefly present the goals, main characteristics and methods of TSc, as well as a contextualization of this new research paradigm in relation to other approaches in the field of transformation research. I argue that the goals of TSc, in combination with characteristics of its methods, constitute a valuable analytical framework for measuring the quality of TSc methods. I present the analytical framework developed in the first article of this thesis, published in 2021 in the journal *Sustainability Sciences*, in collaboration with my colleague Maria del Valle Barrera, under the title "Testing the quality of transformative science methods: the example of the Human Scale Development approach" (Spiering and Barrera 2021). I argue that this analytical framework enriches TSc as an instrument for measuring the quality of various methods. In the second part of the chapter, I use this framework to analyze the HSDA (as Barrera and I do in the second part of the above-mentioned article). I show, on a theoretical-conceptual level, why the HSDA is a suitable method for TSc research, and how it adds value to TSc due to its specific criteria and characteristics. And I argue that this procedure can also be applied to other methods to assess their transformative potential. Since the publication of this conceptual article took place after most empirical parts of this work had been completed, the conceptual argument is grounded in the insights gained from the empirical analyses.

[2]The main arguments presented in this chapter are based on the argumentative structure and logical order of the first publication (Spiering and Barrera 2021, see Appendix A.1) in this dissertation project.

2.1 Transformative science and a framework to assess the quality of its methods

About transformative science

Transformative science (TSc) is a fairly new research paradigm. To introduce its specific objectives, methods and characteristics, it is helpful to provide a brief heuristic contextualization of TSc in relation to other research approaches that are equally committed to the goal of sustainable development and exist under the wider umbrella of **transformation research** (Figure 2). **Transformation research** was launched by the German Advisory Council on Global Change (WGBU) in 2011 as a reflective and systemic approach aiming at a "global transformation towards a low-carbon society" through a democratic exploratory process (WGBU 2011: 332). **Transformation research** is regarded as an "emerging and common research perspective" (rather than a research field), which has widely been replicated and can "serve as catchment basin and integrator of diverse angles on societal change towards sustainability" (Wittmayer et al. 2018: 6). **Transformation research** aims to analyze and understand transformation processes. In the recent German academic debate on **transformation research**, a distinction is made between descriptive-analytical research and transformative research. To put it briefly, descriptive-analytical/knowledge-first approaches work with a "description and analysis of past, current, and future states" (Wiek et al. 2012: 7), as is the broadest sense the case in **transformation research** that concentrates on the generation of conceptual knowledge. Within the experimental turn in sustainability-related social sciences of the years 2011 onwards, these "linear and technocratic solution approaches" (Bergmann et al. 2021) proved to be insufficient to solve wicked and super-wicked problems.

Since then, the generation of "actionable knowledge" has been an important claim of action- and solution-oriented research. Hence, transformational/process-oriented/transformative approaches complement these types of research and claim to produce actionable knowledge while also developing "evidence-supported solution options" (Wiek and Lang 2016: 32). These transformative approaches are a key characteristic and aim of **transformative research** (Miller et al. 2014, Wittmayer and Schäpke 2014). Wiek and Lang (2016) use the term 'transformational research' as synonym for transformative research. The aim of **transformative research** is to mitigate or solve complex sustainability challenges with such evidence-based solutions and corresponding actionable knowledge (Wiek and Lang 2016, Bergmann et al. 2021). However, being fairly new, transformative approaches are still far less represented within **transformative research** (Wiek et al. 2012, Feola 2015, Wittmayer et al. 2018). **Transformative research** in turn is part of **TSc** which is composed of institutional change, transformative literacy and — as yet introduced — transformative research (Singer-Brodowski et al. 2021).

In order to contextualize **TSc** in relation to other approaches that exist within the wider umbrella of **transformation research**, I focus on locating **TSc** and its relationship to **sustainability transition research** (Rotmans et al. 2001, Grin et al. 2010, Markard et al. 2012, Köhler et al. 2019), **sustainability sciences** (Kates et al. 2001, Clark and Dickson 2003, Komiyama and Takeuchi 2006, Miller et al. 2014, Martin 2015), **transdisciplinary research** (Klein et al. 2001, Bergmann et al. 2005, Hadorn et al. 2008, Vilsmaier and Lang 2014), and **action research** (Lewin 1946, Chambers 1994, Reason and Bradbury 2001, Greenwood and Levin 2007, Bradbury et al. 2019).

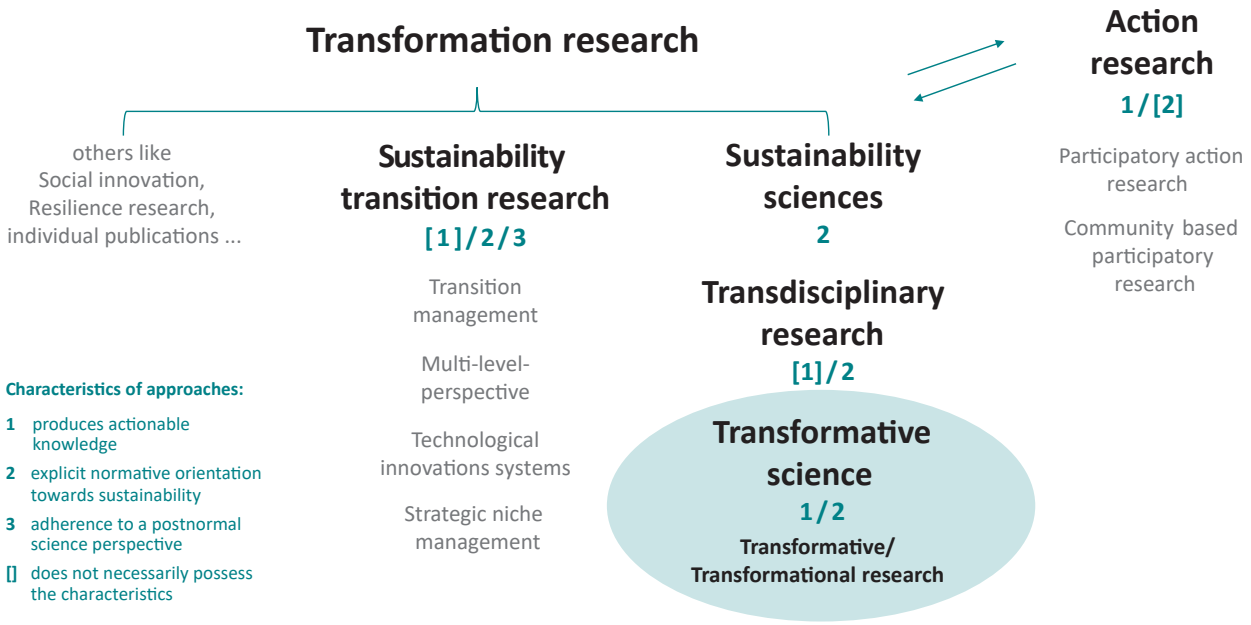

Figure 2: Transformation research as an umbrella: contextualization of TSc in relation to other research approaches. Source: based on Wittmayer et al. (2018)

Except from **action research** (see below) all these approaches exist under the wider umbrella of **transformation research** and employ its perspective and methods. Although there are other disciplines and examples of research that are based on the goals and concepts of **transformation research** (such as social innovation, resilience research, and certain individual publications in various fields), I focus on the above-mentioned approaches as these are — according to my literature review — the main disciplines within **transformation research**. I do not claim to provide an exhaustive analysis of these approaches and of how they relate to each other, as this has been done elsewhere (see Markard et al. 2012, Popa et al. 2015, Scholz 2017, Bierwirth et al. 2017, Wittmayer et al. 2018, Lam et al. 2020). Instead, I refer to three characteristics that the approaches possess to varying extents in order to show their different emphases and how they differ from **TSc**. The three characteristics are, first, **the claim to produce actionable knowledge**, second, **a normative orientation towards sustainability** and, third, **adherence to a postnormal science perspective** (Funtowicz and Ravetz 1995). The main pillars of postnormal science, to put it very simplified, change the role of science fundamentally: "abandoning the pursuit for realistic descriptions and looking for bottom-up citizen processes to validate science" (Scholz 2017: 15) are in contrast to 'normal' science that serves as a public good.

Basically, there are some overlaps of the approaches and the demarcations are not always clear-cut, so that after I first briefly introduce the approaches, I later discuss their intersections.

Sustainability transition research as an approach within **transformation research** follows a normative orientation toward sustainability and claims to produce actionable knowledge. What differentiates **sustainability transition research** substantially from **transdisciplinary research** and **TSc**, but also from **action research**, is that it departs from the disciplinary matrix and widely denies the division between science and practice (Scholz 2017). **Sustainability transition research** has been seen as following the tradition of postnormal science (Funtowicz and Ravetz 1995, Turnpenny 2012) and thus as promoting "a revolution of science [...] with a new positioning and validation of the common science order" (Scholz 2017: 15), rather than an evolution of the current science system (as is the case with **sustainability sciences, transdisciplinary research** and **TSc**).

Sustainability science is a widespread approach based on a normative orientation towards sustainability; it does not necessarily claim to produce actionable knowledge, however. ***Sustainability science*** encompasses **transdisciplinary research, transformative science and transformative research.** In general, **sustainability science** is broadly shaped by geographers and deeply geographical, as it aims at situating complex interactions in place and making them "tractable, understandable and manageable" (Kates 2003: 2).

Transdisciplinary research is also normative in orientation and sometimes but not always produces actionable knowledge.

Action research (at least as described by Wittmayer et al. 2018) is not subsumed under **transformation research**; nonetheless, as a very long-standing approach, it has been inspirational for all **transformation research** approaches (Scholz 2017). The explicit goal of **action research** is to catalyze action, and yet it is not necessarily oriented toward sustainable development. A growing body of literature exists in which action research is applied to sustainability transitioning (Bradbury 2015, Campos et al. 2016, Bartels et al. 2020), while Bradbury et al. (2019) have recently stressed the urgent need for an action-oriented transformation approach.

Finally, ***TSc*** has been proposed as a new paradigm (Schneidewind and Singer-Brodowski 2013, Singer-Brodowski et al. 2021) and is positioned as part of **sustainability science** (Schneidewind et al. 2016) and **transdisciplinary research** (Jaeger-Erben et al. 2018). Its aim is to catalyze action, it has a normative orientation, and it "aspires to a new governance of science under the perspective of efficient use for local and global societal goals" (Scholz 2017). Otero (2017: 3) describes **TSc** as "marking a form of action research" whereas others (Scholz 2017) discuss **TSc** as part of **transdisciplinary research** and suggest a transformation-oriented transdisciplinarity (Jaeger-Erben et al. 2018: 120). **TSc** includes **transformative** (or, synonymously, transformational) **research**, but goes beyond that and additionally encompasses transformative education and a focus on institutional changes in the science system (Schneidewind et al. 2016). The scientific community agrees that the three main goals of TSc are: 1) generating new knowledge (scientific research objectives), 2) initiating and accompanying transformation processes (practical objectives), and 3) stimulating and supporting learning processes (educational objectives) (Beecroft et al. 2018, Vogt and Weber 2020). These objectives form the basis of the analytical framework a colleague and I developed in Spiering and Barrera (2021). I present this framework in the following section as a means to assess the quality of TSc methods. I have chosen to frame the main argumentation of this dissertation as TSc, as I conduct transformative research in an environment of transformative education. In my opinion, transformative research cannot take place in a vacuum and must therefore — if it wants to meet its aspiration and, where appropriate bring about changes — critically reflect on institutional circumstances and specific restrictions.

There are several overlaps and commonalities among the approaches discussed here: **sustainability transition research, TSc** and **action research** apply transdisciplinary methods, and **transdisciplinary research** is mainly inspired by **action research** (Scholz 2017). **Transdisciplinary research, sustainability transition research** and **TSc** "aspire to introduce new ways of doing and utilizing science for societal learning and transitioning. Doubtlessly, all approaches see science as a change agent and scientists as reflective and reflexive" (ibid. 2017: 9). Thus, there is general agreement on the dominance of descriptive-analytical approaches over transformative (action-oriented) approaches in **transformation research**, and on the need for more empirical research and the actionable knowledge this can produce (Feola 2015, Wiek and Lang 2016, Schäpke et al. 2016, Scholz 2017, Wittmayer et al. 2018, Sovacool et al. 2018). I argue that advancing TSc can help to provide a sound basis for such actionable knowledge.

Testing the quality of transformative science methods

Article 1 (Spiering and Barrera 2021) relates its starting point to the problem that the assumptions underlying TSc have been the subject of much critical reflection (Strohschneider 2014, Grunwald 2018, Meisch 2019). This intra-scientific debate has initiated a process of clarification on the relationship between science and society, the role of research in democracies, and funding conditions (Singer-Brodowski and Schneidewind 2019). At the same time critical voices are warning that theoretical debates are developing so rapidly that the empirical knowledge base cannot keep up and increase at the speed that would be necessary (Jaeger-Erben et al. 2018). As TSc is in the developmental stage, it needs more systematized approaches and sound empirical TSc research practice, with solid methodological and theoretical foundations (ibid.). Hence it seems worthwhile not only to develop new methods but also to rethink and possibly expand or adapt existing methods or clarify their potential as methods for TSc (Wittmayer et al. 2018: 18).

A wide range of methods exist that are not necessarily declared to be 'TSc methods', but that co-produce actionable knowledge for sustainability transformations within safe spaces in experimental ways (Wiek and Lang 2016, Wagner et al. 2016, Wittmayer et al. 2018, Borner and Kraft 2018, Defila and DiGiulio 2019, Caniglia et al. 2020, Bergmann et al. 2021). For example, the Global Environmental Outlook (UN Environment 2019: 584) provides an exhaustive list of such methods and concludes that "these approaches can be an important step in navigating onto a more sustainable trajectory".

In order to shed more light on the requirements and characteristics of methods for TSc, article 1 refers back to the general methodological guidelines for transformation/transformative research already mentioned in the introduction. To recapitulate them briefly: different scholars call for 1) a combination of diverse methodological frameworks (descriptive-analytical as well as transformative) to generate actionable knowledge, 2) collaboration and co-production with diverse stakeholders, and 3) a contribution to the generation of three different types of knowledge (Lys 1997, Lang et al. 2012, Wiek and Lang 2016). These consist of systems knowledge (about what is), target knowledge (about what should be), and transformation knowledge (about how to achieve the desired state) (Grunwald 2007, Hadorn et al. 2008, Gaziulusoy and Boyle 2013). The transition management cycle developed by the German Wuppertal Institute (based on Loorbach 2010) links transformation research with transformative research to achieve all three types of knowledge correspondingly (Bierwirth et al. 2017: 30). Such an oscillation between different modes of knowledge production contributes to the accountability of TSc research (Otero et al. 2017, Pereira et al. 2020) and provides a blueprint to generate socially robust knowledge.

In particular, co-design, practical relevance, democratic knowledge production[3], normativity and a catalyzing role are core characteristics of TSc and differ from the widely accepted standards of disciplines focusing only on descriptive-analytical knowledge production (Beecroft et al. 2018, Jaeger-Erben et al. 2018). The high personal involvement of the researchers and their different roles, as well as the societal relevance and educational impact,

[3]Democratic knowledge production is particularly linked to representativeness. Depending on the underlying concepts of democratic theory, representativeness can be negotiated differently in TSc processes (Alcántara et al. 2018). Neither 1.) statistically representative images of the population (neoliberal concept of democracy), 2.) experts, i.e. bearers of specific knowledge (functional understanding), 3.) legitimate spokespersons who consider all arguments and positions on a problem (deliberative concept of democracy), nor 4.) the inclusion of groups and positions remote from power (emancipatory understanding) are considered to be universally valid criteria for representativeness in TSc processes. Rather, representativeness — and thus democratic knowledge production — depends on the topic, context and goal of a participatory process and must be transparently communicated and reflected upon (ibid.).

underpin the argument that TSc needs quality criteria for testing the fit of its methods that go beyond those commonly used to date (such as excellence, peer review and citation indexes). Kläy et al. (2015) describe how academic institutions often do not have a clear understanding of sustainable development and transdisciplinary research, and therefore lack criteria to assess the quality of these 'new' types of research. This, they argue, also leads to systematic discrimination against projects and publications that want to contribute to sustainability transformations. They conclude that "such an approach [i.e. journal ranking] generates a rather narrow and idiosyncratic view of excellence" (Kläy et al. 2015: 3). It is therefore crucial to reflect jointly on how to co-produce transparent and credible knowledge, and to ensure that research practice can benefit from a canon of methods that has been tested for quality (Wiek and Lang 2016, Stelzer et al. 2018, Defila and DiGiulio 2018). To achieve this, the quality criteria should be based on the aforementioned characteristics (co-design, practical relevance, democratic knowledge production, normativity and a catalyzing role) (Jaeger-Erben et al. 2018). To test the fit of a method as TSc method the characteristics should be met and this contributes to the quality of TSc research. To my knowledge, thus far no such comprehensive catalogue for assessing TSc methods existed previously within the literature. I therefore set out to establish how TSc methods can be tested, working on the assumption that quality criteria other than the conventional ones are needed.

In Spiering and Barrera (2021), my colleague and I compiled quality criteria (Wittmayer et al. 2018), essentials (Fazey et al. 2018) and characteristics (Parodi et al. 2019), and developed an analytical framework that is sustained by the three objectives of TSc, and can therefore be used to assess the quality of TSc methods and combinations of methods.

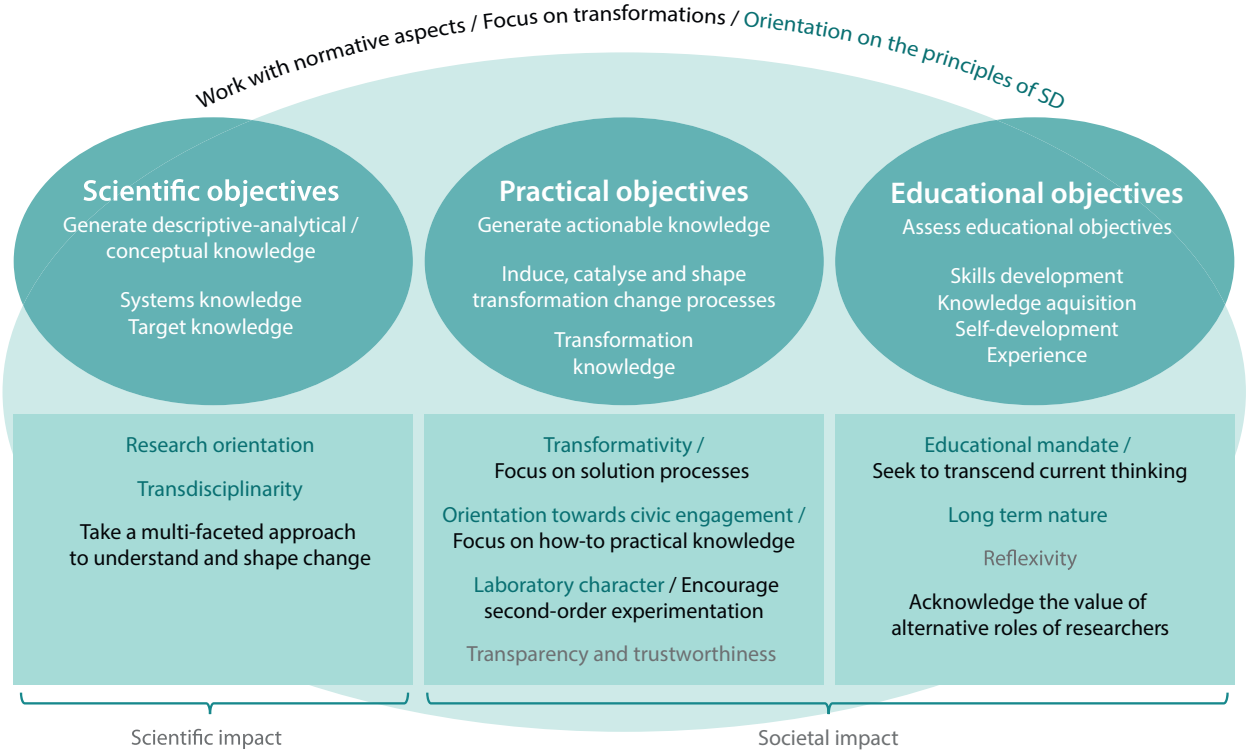

Figure 3: Analytical framework to assess the quality of TSc methods based on three goals of transformative science and the related characteristics. Source: Spiering and Barrera (2021: 1446)

In the following section I give a succinct description of the framework and its main components. Normativity in the sense of a transformative change towards sustainability is the overarching goal of TSc and requires explicit positioning with regard to the goals for sustainable development. This frequently existing 'normativity gap' must be closed by TSc methods; this should be understood as the goal overriding all other factors (Schäpke 2018, Fazey et al. 2018, Wamsler et al. 2020, Hölscher et al. 2021). This is made possible by the fact that TSc methods challenge unsustainable practices, "structures, systems, mindsets and cultures" (Fazey et al. 2018: 57) and combine scientific knowledge production about transformations with the instigation of practical changes and the facilitation of learning processes (Beecroft et al. 2018).

With the scientific objectives, TSc methods aim at generating scientific impact. In terms of the three types of knowledge mentioned above, TSc methods generate all three, but in the three different fields of the objectives depicted in figure 3: first descriptive-analytical systems- and target knowledge accrues in inter- and transdisciplinary settings (Lys 1997, Parodi et al. 2019, Beecroft et al. 2018). TSc methods contribute to a multi-faceted approach to understanding and shaping change (Fazey et al. 2018). The knowledge generated is then fed back into and enhances the scientific debate.

The (second) practical objective of TSc is to achieve a social impact by co-producing the third and essential because actionable 'kind' of knowledge: transformation knowledge. This is characterized by a focus on solution processes, an orientation towards civic engagement, the generation of how-to, practical, solution-oriented and deeply embodied knowledge. For the generation of such knowledge, safe spaces for experimentation and iterative mutual learning are required (ibid., Parodi et al. 2018, 2019).

Lastly, educational objectives also create societal impact and have often been neglected. The educational mandate of TSc should be acknowledged (Parodi et al. 2018, 2019), and skills development, knowledge acquisition, self-development and experience should be assessed (Beecroft et al. 2018). To support these different kinds of learning, TSc processes should ideally be of a long-term nature (Parodi et al. 2018, 2019) and seek to transcend current thinking (Fazey et al. 2018: 57). As part of this, reflexivity is seen as a crucial element of TSc (Finlay 2002, Pereira et al. 2020), since it is vital to reflect on the relation between researchers and practitioners, the influence of researchers on the processes and outcomes, and their underlying (normative) assumptions (Wittmayer et al. 2018, Fazey et al. 2018). This also requires researchers to reflect on and evaluate their different roles in TSc research processes through self-reflexive practices and a consideration of their own background and competencies (ibid., Wittmayer and Schäpke 2016, Brundiers et al. 2021).

Having developed and compiled this framework based on a literature review, I was able to offer a comprehensive proposal to assess TSc methods regarding several closely interrelated dimensions. As such an assessment tool to my knowledge did not exist before, this proposal closes a crucial gap within TSc. Thus, the article can also be linked with the broader debates about the assessment of quality within qualitative social science research — a long-standing point of discussion among colleagues in the context of energy research and social sciences (Sovacool et al. 2018), resilience research (Olsson et al. 2015), or place-based research (Horlings 2016, Horlings et al. 2020). The framework highlights the need for an integrated, broad-based and holistic approach towards measures of impact within TSc. This is in line with what Kläy et al. (2015: 4) call "paradigm transformation in the very conception (and institutionalization) of science as a human activity". They argue that "this requires a much stronger community of scientists […] willing to address

the normative and epistemological issues involved in 'doing science' as a conscious member of society in an increasingly complex world in need of more sustainable development". In a similar vein, Sovacool et al. (2018: 14) state that "research is not only an art or craft, but a civic duty. We argue that more applied research is needed in the field of energy social science, that researchers should think about policy/practitioner applications when developing their research objectives, and that, where appropriate, researchers should seek to integrate practitioners directly into the research process".

My next step was to apply the framework in order to conceptually test the fit of the Human Scale Development approach, which I had proposed for inclusion in the TSc methods canon (see section 1.3). This made it possible to test not only the quality of the HSDA as an approach for TSc, but also the framework itself.

2.2 A NEEDS-BASED APPROACH ADDS VALUE TO THE TRANSFORMATIVE SCIENCE METHODS CANON

Within this sub-chapter I outline the conceptual considerations underlying the first article and why I argue the HSDA is a suitable method for TSc. Using the analytical framework presented in the previous section, this sub-chapter will explain how I examined the HSDA, that I briefly presented in the first part of the introduction, with regard to its fit as a method for TSc.

First, I refer to theoretical-conceptual aspects and references in the literature to trace how the needs perspective of the HSDA is related to sustainability. Second, I draw on a content-analytical perspective and summarize (in box 1) the most important findings of the assessment of the HSDA as a method for TSc.

The first dimension, then, is a theoretical impulse arising from the literature review. Building on my remarks in section 1.3, I argue in this chapter that linking sustainability with needs, as understood by Max-Neef et al. (1991), offers a unique perspective, which can inform and enrich TSc. Needs, as they are understood on the basis of the Brundtland report (WCED 1987), focus almost exclusively on the provision of material goods. To counteract this one-dimensional legitimation of economic growth, various approaches (in addition to the HSDA) were developed in the late 1980s, proposing a broader understanding of needs (Sen 1984, Doyal and Gough 1984, Wiggins 1987). Guillen-Royo (2020: 114) puts this expansion in perspective: "They add a normative dimension to descriptive theories of consumption through concern for intra- and inter-generational justice and equity, while making a strong theoretical claim with respect to satiation. The latter implies that the volume of goods, services, and infrastructures required to achieve an optimal level of needs satisfaction diminishes as the quantity increases and eventually levels off — a point highly relevant in connection with environmental breakdown".

HSDA expands the purely material perspective by drawing attention to the distinction between needs and satisfiers. Based on empirical evidence, a set of nine fundamental human needs (FHNs) was compiled: subsistence, protection, affection, understanding, participation, idleness, creation, identity, freedom and sometimes transcendence (see table 1).

Table 1: Fundamental human needs as compiled by Max-Neef et al. (1991)

Subsistence	Access to food, shelter, employment = need to remain alive
Protection	Safety and protection = need to reduce the exposure to risks
Affection	Friendships, a healthy family, emotional care = need to give and receive love
Understanding	Encouragement to be investigative and curious = need to comprehend
Participation	Ability to interact, share ideas and humour, mutual respect = need to be an active part of society
Idleness	Freedom to imagine a future, reflect on the past, dream, have fun = need for free time without paid labour
Creation	Freedom to express passion, boldness, inventiveness, and curiosity = need to express oneself by crafting
Identity	Sense of belonging, consistency, values, symbols = need to be oneself
Freedom	Acceptance — open-mindedness, tolerance = need to be responsible for one's own actions
Transcendence	Need for spiritual development

Additional to the universal FHNs the second dimension in the theory of Max-Neef et al. (1991) is about the so-called 'satisfiers'. To evaluate how the universal FHN can be fulfilled, the authors introduce a matrix of needs and existential categories of being, having, doing and interacting, in which these needs are satisfied. In the methodological proposal presented by Max-Neef et al. (ibid.) communities reflect in a participatory process on their FHN and fill the matrix elements with respective satisfiers. The crucial concept in their theory is the distinction between FHNs and the strategies to satisfy these needs. The satisfiers or strategies are highly diverse and differ spatially, temporally, individually and within different cultures. Satisfiers may be social practices, values, norms, forms of organization, and attitudes, and may be either individual or collective in nature. In participatory processes, communities or groups can evaluate the satisfiers and analyze whether they impede or promote the satisfaction of FHNs. Needs are to be understood as a closely related, interactive system, in which — in contrast to Maslow's theory (1987) — there is no hierarchy of individual needs. Rather, the fulfillment of needs is characterized by simultaneity, complementarity and compromises. Their realization can involve several satisfiers at the same time, and they can be either complementary or incompatible. This is reflected in the characterization of satisfiers as impeding (destructive or inhibiting satisfiers, or pseudo-satisfiers that claim to fulfill needs but actually reduce or impede their fulfillment) or promoting (singular or synergic satisfiers that fulfill only one particular need or several needs at a time), and in the fact that they are conceptualized and implemented as either top-down (exogenous satisfiers) or bottom-up (endogenous satisfiers).

Max-Neef et al. (1991) thus introduce an alternative framework for needs actualization (as opposed to the idea that needs can only be addressed via material goods). As such HSDA provides — in addition to the category of "having" — further categories for the actualization of needs such as "being," "doing" and "interacting." Needs are interpreted as basic psychological needs shared by all human beings, whereas material goods are understood as satisfiers, which can be extremely diverse in shape and scope. Human well-being is thus based on the "fulfillment" of FHNs and not on "satisfaction" brought about by material consumption. This perspective may provide answers to the question of what one really needs to live a good life. Cruz (2006) summarizes the HSDA offers a development theory based on FHNs, which goes beyond economic rationality and comprehends the human being as a whole.

Moreover, the distinction between needs and satisfiers provides an important dimension concerning their "sustainability": while needs can be neither sustainable nor unsustainable, satisfiers can. Rauschmayer et al. (2012) and Guillen-Royo (2016) equate the concept of synergic satisfiers with "sustainable" strategies, as they allow for the actualization of several needs at a time or even enhance the actualization of another need. Guillen-Royo (2020: 115) concludes: "as noted by several participatory studies […] this suggests that in communities or larger societies characterized by the presence of synergic satisfiers, negative environmental impacts can be greatly reduced". The fact that these synergic satisfiers cannot be imposed top-down highlights their nature as endogenous and created bottom-up, on a "human scale" (Kletzka 2021: 85). Synergic satisfiers are considered as "sustainable" not only in relation to environmental issues (Jolibert et al. 2011), but also regarding social sustainability issues (Pelenc 2014, Olivares-Aising and Barrera 2019) and economic sustainability challenges (Guillen-Royo 2016, Göpel 2016). There have been increasing efforts by several authors in recent years to test the potential of the HSDA in the context of environmental sustainability and sustainable development (Cruz et al. 2009, Jolibert et al. 2011, Guillen-Royo 2016, 2020, García Ochoa and Graizbord 2016, Lamb and Steinberger 2017, Vita et al. 2019, Kaltenborn et al. 2020, Murata et al. 2021). Nonetheless, one has to be careful, as more evidence is needed to claim that all synergic strategies are inevitably sustainable.

The broader understanding of needs described above, along with the conceptual link between need fulfillment and sustainability, empowers individuals as well as collectives to evaluate, design and implement, on a local level, sustainable strategies that will contribute to overall well-being (Rauschmayer et al. 2012, Rauschmayer and Omann 2015). Max-Neef et al. (1990: 21) open up a further dimension: in their conceptualization, needs are satisfied "with regard to oneself (*Eigenwelt*); with regard to the social group (*Mitwelt*); and with regard to the environment (*Umwelt*)". In Spiering and Barrera (2021), we argue that the conceptual link between needs and sustainability includes a longer-term perspective, hence a fourth context can be added — posterity (*Nachwelt*) (see figure 4).

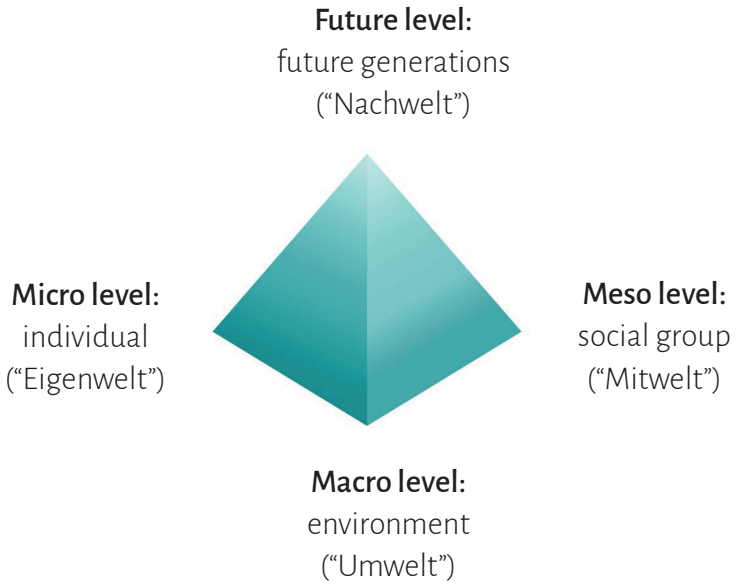

Figure 4: HSDA contributes to sustainable development in four dimensions. Source: Spiering and Barrera (2021: 1442)

To conclude the argument, then, HSDA can contribute to TSc by helping those researchers and non-scientific actors involved to move from the individual level of needs satisfaction to a collective dimension. By reflecting on the satisfaction of FHNs, it takes account of the individual (micro level), the social group (meso level), the environment (macro level) and future generations (future level). With its unique link between needs and sustainability, HSDA offers a special normative compass as its emphasis on needs fulfillment is a dimension previously unexamined for TSc.

With this theoretical-conceptual background, I draw on a more content-analytical perspective. As part of my empirical research I have applied the HSDA following a workshop procedure developed by Monica Guillen-Royo, which she kindly made available to me. It is based on the procedure described in the original workshop outline by Max-Neef et al. (1991). In the course of the ten workshops that I conducted, the concept was continuously refined and expanded to include additional elements that would generate transformation knowledge: the participants not only carried out a status analysis, but the workshops ended with concrete steps to be implemented. A brief summary of the adjustments can be found in Spiering and Barrera (2021). We published a detailed description in Spiering and Barrera (2020) (which I will refer to again in chapter 3). This self-generated empirical knowledge, complemented by evaluations from other authors, is the basis of the empirical analysis of the suitability of the HSDA as a method for TSc in Spiering and Barrera (2021). The article aims at establishing how to test the HSDA as a method to promote transformative sustainability research using TSc quality criteria.

The following box presents a summary of the thrust and objectives of article 1 (Spiering and Barrera 2021).

SUMMARY ARTICLE 1

Spiering S, Barrera MdV (2021): **Testing the quality of transformative science methods: the example of the Human Scale Development approach. Sustain Sci. https://doi.org/10.1007/s11625-021-00966-3 (Appendix A.1)**

This theoretical-conceptual article starts by describing the absence of systematic approaches for mobilizing knowledge in support of interventions to bring about transformative change in the broader area of sustainability sciences. The article introduces TSc and discusses the need for new quality criteria in this field, providing an overview of its methods, goals and flaws. It points out that scientific outputs remain limited in addressing fundamental sustainability challenges. By contrast, TSc seeks not only to describe and analyze transformations, but to co-create and assess possible solutions and to carry out an educational mandate (Beecroft et al. 2018, Bergmann et al. 2021). Using the previously presented analytical framework (section 2.1) for the quality assessment of TSc methods based on these three goals of TSc, this article offers an empirically supported analysis to assess the suitability of the HSDA as a TSc method. It aims to answer the following questions: To what extent can HSDA serve as a method for TSc? Is HSDA applicable in the context of TSc? If so, what added value can it deliver to the existing canon of TSc methods? The article states that the HSDA, due to its special perspective on needs, offers a wider perspective that has previously been neglected. To illustrate, justify and exemplify the conceptual argument, the article refers on the one hand to applications of the original HSDA methodology (Max-Neef et al. 1991), and on the other hand to applications of two different adaptations, which my colleague (Barrera 2017, Spiering and Barrera 2020) and I (Centgraf 2018a, Spiering and Barrera 2020) have made to the HSDA to make it even more usable for TSc. On a first level of knowledge, the article tests the HSDA on the basis of the analytical framework and shows how the original approach, but above all the subsequent adaptations of the HSDA, meet the quality criteria. On a second level of knowledge, the article shows the added value of the HSDA for the canon of TSc methods.

HSDA processes are apt to meet general methodological requirements and contribute to generate three types of knowledge

Based on case analyses, the article shows how HSDA applications meet the general methodological requirements for TSc, and also contribute to generating three types of knowledge. The first general requirement is for a combination of diverse methodological frameworks. In order to gain additional systems knowledge and to reflect collaboratively on outcomes, the authors conducted a triangulation using complementary methodological instruments before, during and after the HSDA workshops (graphic scales, semi-structured interviews, questionnaires and oral evaluation sessions). The second requirement is collaboration and co-production with diverse stakeholders: this is a core element of the approach, as groups are crucial to meeting individual needs and generating well-being, and vice versa. HSDA processes as proposed in the article constitute a self-reflexive tool, which, beginning with problem definition and a joint understanding of terminology, promotes a dialogic process containing numerous elements of mutual learning.

The article goes on to show that joint problem definition results in robust application-oriented outcomes (systems knowledge through the identification of impeding satisfiers); joint vision development results in empowerment (target knowledge through the identification of optimal satisfiers); and the co-creation of development strategies results in long-lasting, sustainable solutions (transformation knowledge through synergic bridging

satisfiers). Hence, the original HSDA proposal and especially the two adaptations provide a highly suitable tool for encouraging creativity, empowerment and solidarity while generating knowledge essential for TSc. With the generation of these three types of knowledge within recursive learning loops, the HSDA provides useful entry points and can generate scientific as well as societal impact.

HSDA meets TSc quality criteria and adds value to the TSc methods canon

A second level of insight from the empirical analyses is related to the implications for TSc and leads to a compilation of key elements with which the HSDA enriches TSc. Concerning normativity, HSDA re-orients sustainable development, as it offers explicit normative orientations by conceptually linking needs with sustainability. Concerning scientific impact, an increasing number of scholars are generating and reintegrating conceptual knowledge gained through transdisciplinary HSDA processes into their respective disciplines (Gonzales 2010, Lamb and Steinberger 2017, Vita et al. 2019, Kletzka 2021). As to practical impact, HSDA processes open up spaces for experimentation by developing the conditions for transformative change among actors of civil society. Nonetheless, it remains difficult to assess social impacts more precisely. Therefore, humility regarding possible solutions is needed, as the transformative implications of an intervention can only be assessed retrospectively (van der Hel 2018, Jaeger-Erben et al. 2018). As to educational impact, the HSDA with its dialogic processes contains numerous elements of mutual learning for all those involved in the research process. This includes skills development as well as so-called "process impacts," which include "changes in modes of collaboration, relationships, everyday practices and worldviews" (Horlings et al. 2020: 471): HSDA encourages reflection, allowing the contestation of prevailing views, needs and interests through individual and social learning processes, and triggering counter-hegemonic processes. In HSDA processes the various roles that scientists play are especially significant: the importance of the facilitator's personal involvement is stressed. The article argues that it is necessary for researchers to become aware of both, their own normative assumptions and their influence on the field in regular self-reflexive practices and if necessary to adjust the manner in which they conduct their research or to acquire additional competencies.

Summing up and supplementing a further aspect, it can be stated that the quality analysis of the HSDA as a TSc method reveals that it adds value to TSc on various levels: (1) HSDA contributes to achieving the three main objectives of TSc while generating all three types of knowledge; (2) HSDA provides an explicit normative compass for TSc by linking needs with sustainability; and (3) by including reflection on needs and focusing on human well-being, it contributes to a shift in mindset and reveals where the current scientific system needs to be transformed to support research for sustainability.

2.3 Main contributions of this chapter to transformative science

The paper's findings for TSc are: Methods that support bottom-up processes are available; it is a matter of combining and adapting them according to the requirements of each situation. In this field a distinction between a descriptive-analytical and an action-oriented focus is helpful. Additional and different quality criteria for 'measuring' transformative methods are necessary because of their practical orientation. The article summarizes the three goals of TSc (scientific, practical and educational) for the first time and proposes an analytical framework for assessing its methods by connecting the goals with a set of criteria. This analytical framework is tested by undertaking an analysis of the HSDA; this example shows how other methods could also be analyzed as to whether they are suitable for TSc. The article shows that the HSDA enriches TSc through its unique focus on needs, which has so far been unexplored for TSc and is able to provide the three types of knowledge (systems-, target- and transformation knowledge) necessary for transformations. The theoretical and conceptual analysis presented in this chapter can be interpreted as a contribution to scientific impact in respect to the three objectives of TSc.

3 INTEGRATING VALUES INTO TRANSFORMATIVE SCIENCE METHODS

This chapter deals with methodological extensions and practical and ethical discussions with regard to the adaptation of methods for TSc.

3.1 Value-driven bottom-up approaches based on *phrónêsis and techné*

Building on the distinction between descriptive-analytical and action-oriented knowledge production presented in the previous chapter, the preliminary theoretical considerations in this methodological chapter[4] focus on how values can be integrated into methods for practical, that is action-oriented, knowledge production. My hypothesis is that the inclusion of values in knowledge production can be a trigger for sustainability transformations. The chapter therefore highlights the added value of applying the Aristotelian concepts of *technē* and *phrónêsis*[5] when discussing the need for methods to support the production of practical (actionable, transformative) knowledge. It also considers how to adapt methods to make them even more useful for informing TSc research praxis with a focus on values.

One lens to approach the different knowledge types and their differing natures is the perspective presented by Aristotle (2004), which has been increasingly taken up by various scholars within sustainability science (Martin 2015, Sharpe et al. 2016, Fazey et al. 2018, Polman et al. 2020) and action research (Eikeland 2006) in recent years. Descriptive-analytical knowledge can be interpreted as what Aristotle classifies as "epistemic knowledge", that is, logically structured knowledge, which the natural sciences in particular strive to produce (Flyvbjerg 2001). This knowledge is teachable, is detached from practical action, and is of late more and more often criticized for claiming to be the only pure and objective knowledge and therefore superior (Harcourt 1994: 19, Flyvberg 2001, Oliver and Dannison 2013). To initiate transformative change processes, as already explained, sustainability science challenges this objectivity of science (Kates et al. 2001), and argues that additional action-oriented, or, as Aristotle (2004) frames it, practical knowledge is required. The articulation of such practical knowledge enlarges

[4]The main arguments presented in this chapter are partly based on the argumentative structure and logical order of Spiering and Barrera (2021), (see Appendix A.1) and mainly based on Spiering and Barrera (2020), (see Appendix A.2).

[5]Aristotle (2004) introduced these concepts within his work on "Nicomachean Ethics" that was written around 340 BC.

overall knowledge, also by including values (Martin 2015); it is mainly associated with the social sciences (Flyvbjerg 2001: 3). Following Aristotle (2004), practical knowledge consists of *technē*, that is productive ("how-to") knowledge, and *phrónêsis*, which is ethical knowledge. *Technē* is normative and embedded in practice, e.g. crafts or skills that are passed on to future generations (Harcourt 1994, Flyvbjerg 2001, Martin 2015). *Phrónêsis*, on the other hand, is practical wisdom (Aristotle 2004) and — in contrast to *episteme* — not just wisdom in theory (Lee 2020: 1). It is associated with "prudence" or "deliberation" and includes values as well as ethical deliberations leading to decisions and practical action (Flyvbjerg 2001, Martin 2015). The Greek and thus western concept of *phrónêsis* has been equated with the Buddhist concept of mindfulness in the East (Lee 2020: 1). Shotter and Tsoukas (2014: 232) state that "through undertaking action, a human agent does not merely contribute to producing something (some 'thing'), but also to acting well — acting in a way that contributes to the fulfillment of a good life". They go on to argue that *phrónêtic* leaders would be "people who, in their search for a way out of their difficulties, have developed a refined capacity to intuitively grasp salient features of ambiguous situations and to constitute a 'landscape' of possible paths of response, while driven by the pursuit of the notion of the common good" (ibid.: 224). This emphasis on the common good is also related to Aristotle's concept of *eudaimonia* — that is "the highest end, reached as a result of virtue" — and has been held up as superior to "hedonic well-being", that is, enjoyment/happiness (Brand Correa and Steinberger 2016: 2). This distinction between happiness and virtue has also been taken up in discussions about needs. But this leads far beyond the inclusion of values and into the realm of philosophy and cannot be further elaborated here. A fruitful inclusion of the concept of *eudaimonia* into sustainability science would obviously make very sound checks and balances and further quality criteria necessary to be scientifically sound.

Since scientific findings of the descriptive-analytical epistemic knowledge type often do not meet the needs of practice or are not accepted as valid by practitioners, great importance is attached to the introduction of *technē* and *phrónêsis* into sustainability science (Oliver and Dennison 2013, Martin 2015, Sharpe et al. 2016, Fazey et al. 2018). Because sustainability naturally entails subjective and normative assumptions, looking at *technē* and *phrónêsis* according to Sharpe et al. (2016) can and should build a bridge between science and practice. Martin (2015: 5) argues in the same direction: the claim of sustainability research is to use suitable decision-making methods, which are problem-driven, value-driven, geared towards social action, and capable of incorporating the decision support information being generated. It therefore seems obvious to include not only *technē* but also *phrónêsis* into social sciences, the main aim of which is to "formulate problems and to conduct analyses that incorporate a range of methods that are both informed and motivated by values in society and aimed at social action — for which decision-making is implicit" (ibid.: 5). To put it simply: "it is not adequate to know what needs to be done and even advocate what needs to be done. It is crucial that something is done and what is done is informed by practical wisdom" (Lee 2020: 2). Hence, practical matters require practical reasoning, which is "deliberative, it takes into account local circumstances, it weighs tradeoffs, it is riddled with uncertainties, it depends upon judgment, profits from wisdom, addresses particulars, it deals with contingencies, is iterative and shifts aims in process when necessary. Practical reasoning is the stuff of practical life. It is not the stuff of theoretical science. Its aim is to arrive at good but imperfect decisions with respect to particular circumstances" (Eisner 2002: 375).

As TSc classifies itself as sustainability science, a linkage between values and knowledge should likewise be represented within TSc methods, which does not mean that TSc is *only* about generating practical knowledge. What Eikeland (2006: 44) states for action research holds true for TSc as well: "Action research should not and cannot be reduced to reasoning 'from' and within such given ends and principles, neither as deductive 'proof', nor as mere unprincipled deliberation or application. If action research is going to be more than just 'applied research', or

complementary 'research/er assistance' to practical development processes, leaving basic research uncritically to other approaches, it has to concern itself with and transform the formative learning processes and the research work directed towards principles, ends, and definitions, too". TSc therefore needs to focus on all three objectives (scientific, practical and educational) and do so by benefitting from *episteme* (scientific data), *technē* (experience) and *phrónêsis* (wisdom) jointly. Thus, the methods of TSc should be able to generate these three forms of knowledge not to be confused with the three types of knowledge described in chapter 2: systems-, target- and transformation knowledge. The process of knowledge production may be the same, but the knowledge accrued is categorized in different ways.

So, how can methods be adapted to meet this requirement? Methods that aim at action-oriented knowledge production and follow bottom-up procedures may be assessed in terms of how much practical knowledge they generate. "The six main phases of participatory research processes" presented by Wittmayer and Hölscher (2016) help to identify knowledge requirements and were used for our research. The six phases discerned in this approach are: (0) joint understanding of problem and terminology, (1) problem analysis, (2) vision building, (3) strategy development, (4) monitoring and evaluation and (5) reflection on the whole process. While various methods and approaches address phase 1, there are few scientific methods for producing knowledge on conducting phases 0 and 2—5 of participatory research processes (ibid.).

In the following section I argue that the HSDA has the potential to fill this gap. To underpin my argument, I will describe in detail the methodological adjustments that my colleague Barrera and I made to the HSDA in article 2 to make it even more suitable as a method for TSc (Spiering and Barrera 2020). I will explain how we expanded the HSDA to ensure that knowledge can be generated not only for phase 1 and partly 2 and 3, but also for phase 0, 4 and 5 and better for phases 2 and 3.

3.2 Adapting the Human Scale Development approach for transformative science

Methodological outline

This section deals with the question of how the original methodological proposal of the HSDA (Max-Neef et al. 1991) needed to be adapted, that is expanded, for TSc, so as to generate both *episteme* and practical knowledge (*technē* and *phrónêsis*), as the original proposal lacked such steps. The adaptation of the qualitative methods occurred in an iterative process of learning and reflection, throughout the years 2016 to 2021, in ten workshops that I conducted in different settings (table 2). In an initial EnGeno case study (2014–2016), two colleagues within the project and I conducted three HSDA workshops in three energy cooperatives in different parts of Germany, to better understand the cooperatives' difficulties and to empower the members to better meet their personal needs (Centgraf 2018a). These workshops were exploratory in nature and were framed by semi-structured interviews with four participants from each workshop. Each was interviewed twice: shortly before and again two to three

months after the workshops (24 interviews in total). These interviews were fully transcribed, coded with text analysis software MAXQDA, and analyzed using a qualitative content analysis (Kuckartz 2014). The results were published in Centgraf (2018a) (see summary article 4).

A fourth workshop within the EnGeno project was carried out as a joint workshop with three other German energy cooperatives from within one region, as well as a transition town initiative from the same area. The aim was to help them develop common energy supply strategies for their region, based on renewable energies (Brischke and Köhler 2018).

In a second case study in 2016, I collaborated with the German BMBF project "Klima-Citoyen" (Schweizer-Ries et al. 2016) and conducted three HSDA workshops in a southern German community to help them reach a decision on forming a communal energy cooperative.

I conducted a third case study in 2016 in Paillaco, Chile, in collaboration with the Institute of Economics of the Universidad Austral de Chile (UACh) and the Community Innovators Lab at the Massachusetts Institute of Technology, Boston (MIT CoLab). Within the HSDA workshop, which I facilitated together with master's students from the UACh, teachers and students of a Chilean technical school identified common strategies to establish a program for renewable energies at their school.

In cooperation with the master's program on Human Scale Development and Ecological Economics at the UACh, I conducted two workshops in four two-hour online sessions with HSD master's students in 2020 and 2021.

Between seven and thirty people participated in each of the ten workshops. All the workshops were audio-recorded, all workshop material was digitalized to facilitate its analysis, and participants received an extensive workshop report. This report served as a basis for further analysis, along with entries in research diaries.

As to the methodological procedure, I first built on the workshop proposal presented by Guillen-Royo (2016). I am deeply indebted to her for making her material available to me. The work of the practitioner Inez Aponte from the "Well and Good Project"[6] also inspired my interpretation and adaptation of several methodological steps within the HSDA procedure. All further adjustments and additional methodological steps and aspects were applied in an iterative process based on the experiences of facilitating the HSDA workshops, regular reflection among colleagues (especially within the EnGeno cases (Lautermann et al. 2017)), and the feedback from the workshop participants. The adaptations are presented in short form in Spiering and Barrera (2021). More detailed methodological guidelines were published previously in Spiering and Barrera (2020). To expand the range of potential impact and to increase the degree of awareness of the HSDA, the publication provides our methodological adaptations in three different languages (English, Spanish and German). To increase the uptake of the adapted HSDA, I submitted the methodological outline of the HSDA to the editorial board of the transdisciplinary platform USYS-TD-Lab[7] in October 2021; this platform provides several methods and tools for co-producing knowledge, in a collaboration between experts and stakeholders from science and practice, aimed at tackling real-world challenges. In doing so, my aim was to increase the accessibility of the HSDA 'tool' (in the sense of *technē*) to a broad public beyond the target audience of scientific publications.

[6]https://wellandgoodproject.wordpress.com/

[7]https://naturalsciences.ch/co-producing-knowledge-explained/methods/td-net_toolbox.

Table 2: Cases in which I applied the HSDA and adapted it recursively. Source: adapted from Spiering (2022)

Case study	Participants	Aims and Objectives	Process and role of HSDA
Transformative potential of energy cooperatives EnGeno (2014-2016) (Centgraf 2018a, Centgraf 2018b)	3 workshops (1.5 days) with members of the management and supervisory boards and active as well as passive members of 3 German energy cooperatives	To support the members of German energy cooperatives whose involvement is mostly voluntary, to support initiatives that are robust in the long-run	Facilitating the development of new strategies which help the individual members of energy cooperatives to meet the challenges arising from their civic engagement
	1 workshop (1.5 days) with three regional energy cooperatives, a transition town initiative and political stakeholders	Networking of various actors to determine development strategies for renewable energy in the region	Identifying deprivations, potentials and common strategies for citizen-driven renewable energy projects
Transformation towards a program for renewables, Liceo Tecnico de Paillaco, Chile (2016)	1 workshop (1.5 days) with teachers and students of the Technical School of Paillaco in Chile	To support the bottom-up foundation of a program for renewable energy in the technical school	Identifying common strategies to establish a program for renewables within the school
Strategy process to form an energy cooperative in Nalbach, Germany, Cooperation with the BMBF-project Klima-Citoyen (Schweizer-Ries et al. 2016)	3 workshops (4 hours each) with major, council members and citizens of the municipality of Nalbach, Germany	To undertake a comprehensive consultation on challenges and opportunities of forming an energy cooperative in the municipality of Nalbach	Facilitating the decision-making process for forming an energy cooperative, reflecting on the negative and utopian factors as well as on strategies
Digital workshops with HSD master's students of the Universidad Austral de Chile, Chile (2020, 2021)	2 workshops (4 hours each) with 7 HSD masters students each	To reflect on being a master's student at UACh during the coronavirus pandemic	Twofold aim: learn about how to facilitate an HSDA workshop and increase the level of well-being of students within the master's program

As part of the cooperation with UACh, I provided guest lectures in their master's program Human Scale Development and Ecological Economics. Here I experimented with virtual formats for the co-production of knowledge with the master's students. I adapted the methodological procedure to the virtual conditions, and was pleasantly surprised by the positive effects that can be achieved using this medium. During the current global Covid-19 pandemic, such virtual adjustments are very promising (although *technē* is changing, *phrónêsis* can still be achieved). This coincides with the experience of Murata et al. (2021), who propose online needs-based workshops adapted from the original proposal of Max-Neef et al. (1991).

So, what adjustments were needed to make the HSDA usable for TSc? We describe two possible adaptations of the HSDA to achieve an improved comparability between these two different adaptations with the original HSDA proposal. In Spiering and Barrera (2020:20) we published on our joint research and presented the commonalities of and the differences between our respective (and different) applications in a table. By the time we published Spiering and Barrera (2021), it seemed more helpful to align our respective adjustments retrospectively with the six main phases of participatory processes as presented by Wittmayer and Hölscher (2016) (see figure 5).

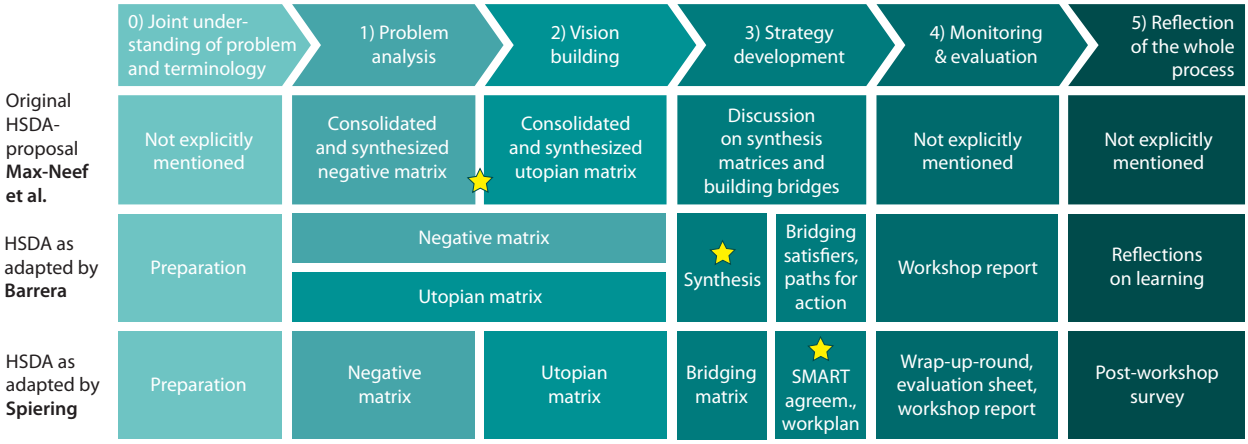

Figure 5: The original methodological HSDA proposal and two slightly differing adaptations.
Source: Spiering and Barrera (2021: 1443)

As can be seen in figure 5, one major contribution of both of our adaptations is the extension to phases 0, 4 and 5, which are not at all covered by the original HSDA proposal (Max-Neef et al. 1991). It turned out that an important success factor for transformative research lies in a very careful conduction of phase 0, as this phase can be used to build mutual trust and develop a common language. The original methodological proposal as well as both adaptations contribute to the generation of systems knowledge by revealing deprivations that are present in a given society (phase 1). All three proposals also contribute to the generation of target knowledge, by envisioning and identifying all those factors that enable optimal fulfillment of FHNs (phase 2), even though in a somewhat different manner, as Barrera's adaptation also helps to generate systems- and target knowledge (phase 1 and 2) at the same time. Both our adaptations put a strong emphasis on phase 3, aiming to develop strategies for further action (transformation/actionable knowledge) by finding possible pathways based on synergic and endogenous satisfiers. These emerging pathways span the whole range of possibilities, and operate as a field within which development strategies, ranked according to their importance and effectiveness, can be elaborated. Lastly, the responsibility for their implementation is set out (in my adaptation in a detailed work plan, defining who is responsible for each aspect and establishing a fixed time horizon). In this phase we both give HSDA an impetus that Max-Neef et al.'s (1991) original methodology lacks. Furthermore, we both emphasize and give guidance for a comprehensive preparation phase 0 and include knowledge production during and for phases 4 and 5.

This procedure generates systems-, target- and transformation knowledge, in which *episteme, technē* and *phrónêsis* are inherent. As such, HSDA with its focus on needs fulfillment and the respective co-creation of synergic and sustainable strategies that can be described as value-based solutions can be a trigger for sustainability transformations. By showing different ways of facilitating the HSDA, it can emphasize different phases and therefore different (research) questions, knowledge interests and needs. The highly flexible nature of the methodological approach of HSDA seems to be one of its main strengths for use in TSc: it has been applied in a wide range of adaptations and different subject areas in the last few years within sustainability sciences and beyond. In Spiering and Barrera (2020) we provide a detailed presentation of several adaptations, and various other recent publications also refer to the needs perspective of the HSDA in a wide range of different contexts (Papachristou and Rosas Casals 2016, Holland 2018, Al-Nasrawi S 2019, Kobayashi et al. 2019, Romero-Varela and Martínez-González 2019, Gimelli et al. 2019, Boshuijzen-van Burken et al. 2020, Rico and Vallejos 2020, Martín-Martín 2020, Abubakar 2021, Murata et al. 2021, Rojas-Rojas et al. 2021).

With another emphasis I applied the HSDA as tool for an autoethnographic self-reflexive practice following the question of 'what were the impeding factors and what were the supporting factors undertaking this PhD project?'. Therefore, I mainly followed the methodological procedure outlined above; instead of discussing the matrix within a group, I first printed out the negative matrix as a poster and added the impeding satisfiers on a flipchart based on introspection and entries in my research diaries. In a second phase, I added all positive factors — potentials that I obtained throughout the PhD project — in a positive matrix. In a next step, I identified bridging satisfiers and completed the matrix with synergic satisfiers that would have supported me in conducting my research. The results of this self-reflexive practice are published in Spiering (2022) and outlined in chapter 5 below.

Critical reflection on the empirical research practice and methodology

As outlined in the previous chapter, TSc research follows other than 'conventional' quality criteria due to its threefold claim to not only generate scientific but also practical knowledge and educational outcomes. It is amply traced within chapter 2 (in respect to conceptual quality assurance of HSDA as a method for TSc) and in chapter 5 (with a comprehensive self-reflexive process regarding obstacles and supporting factors in respect to my own role within the whole research process), how these quality criteria are met. This section sheds light on the shortcomings of the study. These result both from the empirical research practice and the methodological approach outlined above.

The research process did not follow a linear logic from the start. Instead, beginning with the first attempts to make the HSDA usable for the research project EnGeno and adapting it in the course of several iterative processes to make it applicable in the context of German energy cooperatives, my research followed an empirical and explorative trail including uncertainties and trial and error experiences. It became apparent that the HSDA needed to be expanded methodologically and that it was essential to underpin its theoretical-conceptual foundation when aiming at integrating it into TSc. In the preliminary phase of the workshops, issues of power emerged in the selection of workshop participants, and it proved to be challenging to assess how selective and power-laden access to the workshops was. Caused by a lack of time resources, interviews before and after the workshops were only conducted in the case studies with RECs, but not in the seven case studies that followed, where this confidence-building measure of the preparatory phase has obviously been lacking. The importance of creating a safe learning space for learning and building trust also became clear with regard to the process of reflecting on needs: for some participants, the very personal level of reflecting on needs was not only unusual and surprising, but also

uncomfortable at first. In this respect, it was helpful to address the discomfort and also "to understand discomfort as a learning opportunity" (Hölscher et al. 2021). It turned out to be very important to acknowledge all these limitations constantly throughout the process so as to ameliorate further applications.
As we faced time and budget constraints, it was not possible to accompany the practice partners for a longer period of time. As a result of these one-off workshops the continuity of the iterative learning process was limited. Thus, for future or subsequent studies, it is advisable, if possible by any means, to provide for sufficient time and funding early on by planning longer-term projects, as is called for already by several sustainability science scholars (Caniglia et al. 2020, Defila and DiGiulio 2020, Bergmann et al. 2021).

Attributable to a lack of research experience on my part and unclear role assignments within the transdisciplinary research team, we followed a rather unsystematic approach regarding different roles and corresponding competencies needed within the team to fulfill our different roles. In view of the high demands placed on the project team, especially as we had the aspiration to support change agents or to act as change agents ourselves, it would have been helpful for each one of us to define clear boundaries, to perceive supervision, but also to discuss our role allocation from the beginning.

Besides these shortcomings of the empirical research process, further shortcomings of the thesis may be seen regarding the significance of the study for an evaluation of the methodological approach. Basing the empirical study primarily on energy initiatives might provoke criticism regarding the generalizability of the results. Although a comparison of the phenomena under study across other initiatives might generate even more useful insights, I argue that the results presented in this thesis are of value in their own right in order to explain the applicability of the HSDA within TSc if somewhat expanded/adapted and the usefulness of the analytical framework as a quality check for TSc methods. A further shortcoming is that the thesis only outlines the results of the empirical work within three German energy cooperatives. The results of the other seven HSDA workshops are not directly outlined in this work; nevertheless, especially the process results of these additional workshops are incorporated into the corresponding adjustments of the methodology and enrich the conceptual-theoretical contributions of the thesis.

In conclusion, my experience confirms the statement of some authors that the threefold objective of TSc places considerable demands on all those involved (Defila and DiGiulio 2020, Bergmann et al. 2021). The authors point out that TSc processes have special requirements (such as "special and careful attention with regard to dealing with issues of legitimacy, a good management of expectations, and a reflective balancing of opportunities and threats" (ibid.: 64)). Therefore, despite justified critique regarding certain limitations, the analytical framework for quality assurance of TSc processes developed in the context of this dissertation is of great value. It also helps to ensure that HSDA processes are designed in an open-ended manner to avoid falling into the trap of believing that HSDA outcomes must necessarily be 'transformative' (Jaeger-Erben et al. 2018). Thus — being open-ended — the empirical contributions can be understood primarily as explorations, with the claim to set impulses towards changing the environment for the better. Such an approach is very much in accordance with the spirit of TSc as it can be understood as an 'experimental field' or search process.

The following box provides key insights from the analysis of the adapted HSDA applications concerning *technē* and *phrónêsis*.

Summary Article 2

Spiering S and Barrera MdV (2020): How to?! Practical knowledge for transformative science — facilitation guidelines for two applications of the Human Scale Development approach. *UFZ Discussion Papers*, 3/2020. Leipzig: Helmholtz-Zentrum für Umweltforschung — UFZ, ISSN 1436–140X https://doi.org/10.57699/a3y9-gd49 (Appendix A.2)

Multiple methods for transdisciplinary and transformative science have been presented and discussed in the literature on sustainability. There is still a need, however, for wider knowledge on how to implement global environmental change. We argue that understanding practical knowledge with the Aristotelian concepts as *technē* and *phrónêsis* provides important contributions for change, as this concept allows, on the one hand, detailed considerations of the 'craft' of facilitating change processes and, on the other hand, reflections on value-driven research practices. In presenting two different methodological adaptations of the original HSDA by Max-Neef et al. (1991), we show how such practical knowledge in the form of *technē* ("how-to") and *phrónêsis* (values) can be generated and can thereby inform and enrich TSc. We understand our adaptations and suggestions as two possible adjustments among many. Accordingly, a detailed presentation of very different applications of the HSDA in various fields by other scholars is included. One of the main aims of the article is to provide extended information on the facilitation processes, and inspire other scholars and practitioners to apply them in their own settings and further develop them for their own purposes.

Key learnings on *technē*

What supporting factors for applying the HSDA arise from learnings concerning *technē* (here: the craft of conducting participatory workshops)? In the preparation phase, it turned out to be important to dedicate sufficient time and effort to logistics, an inclusive discussion about the selection of suitable participants (which may include questioning power relations), the training of facilitators, as they need to obtain comprehensive knowledge on both the theory and practice of HSDA, and relevant facilitation skills and competencies. To build trust first with and then also among the participants in the run-up to the workshops and their start, we suggest different approaches: preliminary questionnaires or even pre-workshop surveys with semi-structured interviews have proven to be helpful for establishing contact. The preliminary phase is a crucial phase to find a common language for different terms. I suggest, for example, an exercise to become familiar with the needs identified by Max-Neef et al. (1991), which can differ substantially in intensity, depending on which aspects and research interests are assessed. Such exercises support group building, which is a prerequisite for establishing a safe space within which everyone can speak freely.

For the matrix-filling phase, the two adaptations follow different presuppositions. Barrera advocates to identify negative and positive satisfiers at the same time. This raises awareness about factors that inhibit needs fulfillment ("poverties") and about potentials or "wealths" that a group possesses at that given time. My adaptation, in contrast and staying closer with Max-Neef et al.´s proposal (1991), follows the concept of "future workshops" (*Zukunftswerkstätten*) as devised by Müllert and Jungk (1987), provoking a catharsis by explicitly focusing on negative factors in the first phase. In the second phase, I recommend identifying utopian factors (as a first step of backcasting), which unleashes positive energies and motivates participants to think creatively about desirable futures. What is missing here is an explicit diagnosis of current potentials. However, both applications could be fruitfully combined.

SUMMARY ARTICLE 2 CONT.

When it comes to gaining transformation knowledge and envisage and plan solution-oriented actions, group discussions in small groups as well as in the plenary on synergic and endogenous satisfiers are a prerequisite for the co-creation of paths for future development. Their implementation can be supported by prioritizing them in terms of their importance and urgency and defining them in work plans with clearly assigned responsibilities.

Finally, a successful conclusion also includes reflecting back the workshop results. Staying in touch with the participants after the workshops and asking them in formalized post-workshop interviews about the current status of implementation, any obstacles, and any effects of the workshops that may only become apparent later, concludes the collaboration and contributes to accountability.

Key learnings on *phrónêsis*

As key learnings concerning *phrónêsis*, the HSDA most importantly provides a focus on values while rethinking development concerns from ethical and aesthetic points of view (Cruz et al. 2009). As people ground their decisions on values, human action becomes political, in the sense of choosing between different actions commensurate with their values. Accordingly, recognizing values in the discussion on community development furthers decisions on how to achieve good ends and desirable futures. With the reflection on synergic satisfiers that simultaneously fulfill several needs and are presented as sustainable strategies (Guillen-Royo 2016), the HSDA represents a practical tool for a value-driven research practice.

The article concludes by echoing the call for expanded recognition of research through practice and the wider application of *technē* and *phrónêsis* for sustainable development (Sharpe et al. 2016, Fazey et al. 2018).

3.3 Main contributions of this chapter to transformative science

With respect to the three main objectives of TSc, article 2 presented in this chapter created **scientific outcomes** by showing on a conceptual level how the original methodological proposal of the HSDA (Max-Neef et al. 1991) needed to be adapted, that is expanded, for TSc, so as to generate both *episteme* and practical knowledge (*technē* and *phrónêsis*), as the original proposal lacked such steps. To do so, the "six main phases of participatory research processes" presented by Wittmayer and Hölscher (2016) have been applied to the HSDA. It turned out that HSDA, with its adaptations is especially valuable for producing transformation or practical knowledge (that is knowledge for phases 0 and 2-5 of the participatory research processes). By conceptually linking HSDA with the Aristotelian notion of different forms of practical knowledge, the chapter builds on other sustainability science scholars and underpins their argument that looking at *technē* and *phrónêsis* can and should build a bridge between science and practice and as such sustainability science benefits from *episteme* (scientific data), *technē* (experience) and *phrónêsis* (wisdom) jointly (Oliver and Dennison 2013, Martin 2015, Sharpe et al. 2016, Fazey et al. 2018). The main benefit is that the needs of the practice actors can be better met and their acceptance regarding the validity of measures can be increased. At the same time, article 2 shows that the adapted HSDA can support the co-production of value-based solutions and as such can be a trigger for sustainability transformations.

With respect to **practical outcomes** article 2 adds value to TSc as it provides a detailed open access facilitation manual of two possible HSDA adaptations in three different languages, and thereby contributes to knowledge transfer. Regarding **educational outcomes** the article adds value to TSc as the methodological advancement of the HSDA method led to learnings on different levels: Through the facilitation of the HSDA processes, I myself have acquired and further developed a wide range of skills as a TSc scholar; in addition, I have trained other colleagues and students in the facilitation of this method, thereby supporting agents of change for TSc. In the iterative adaptation process over 10 workshops, we were able to co-creatively develop the practical guidelines in a mutual learning process and make them accessible to practitioners and other TSc scholars.

4 FOCUSING ON NEEDS REALIZATION
THE EXAMPLE OF GERMAN RENEWABLE ENERGY COOPERATIVES

This chapter is an empirical one and focuses more broadly on options to support niche actors and agents of change with TSc methods. It provides details from a case study in which I applied my HSDA adaptation in different German energy cooperatives, and it shows how people engaging in these enterprises could be supported based on a reflection of their fundamental human needs (FHN).

The chapter starts by introducing agents of change as important actors for sustainability transformations. I assume that TSc should support such agents of change, as they are an important lever to catalyze bottom-up transformations. To underpin my argument, I present the role of such change agents within transformation as presented in literature. The explanations regarding my practical experience in the second section of this chapter are based on two of my publications (see list of articles: articles 3 and 4). I will briefly discuss the context in which these papers were published, outline their objectives and summarize their content. Article 3 (Masson et al. 2015) mainly served exploratory purposes, as a preliminary approach to the field of German renewable energy cooperatives (RECs). Building on article 4 (Centgraf 2018a), I then show how I applied the adapted HSDA as a means to support the members of German RECs as agents of change. I will show the added value of an approach centred on reflection on needs and what can be learned when the concept is applied in practice.

4.1 Supporting niche actors and agents of change with transformative science methods

Within transformation research, so-called "change agents" are assigned a crucial role in not only influencing but driving transformation processes (Grin et al. 2010, Kristof 2010, Wolff et al. 2018). Who are they, what are their properties or rather, what makes someone or an institution a change agent? The range is very broad, but some common aspects can be described: Agents of change experiment with new (technical) solutions, work bottom-up for sustainability goals, and ensure the spread or implementation of change. By doing so they initiate and facili-

tate transformative processes, their actions being either intentional or emerging as part of social dynamics (Chaffin et al. 2016). Agents of change are not necessarily classic environmental policy actors, and do not even have to perceive themselves as actors in the transformation field under consideration (e.g. mobility, energy services). They may be education actors, market intermediaries, health insurance companies and welfare associations, religious communities, or individuals with 'interpretive power' such as celebrities, columnists or bloggers (Wolff et al. 2018: 52). And they may of course also be high-profile experts from the field of environmental protection, such as senior figures in companies and government agencies, politicians, or prominent representatives of non-governmental organizations, accustomed to promoting climate protection and sustainability objectives (Kristof 2010, Chaffin et al. 2016). Even scientists within transformation research may be assigned the role of change agents (Wittmayer and Schäpke 2014, Hilger et al. 2018), if they take an active stance. Originating from diffusion research (Rogers 1995) and business change management (Beckhard 1969), the concept of change agents found its way into sustainability research (Sommer and Schad 2004: 48). Mautz et al. (2008: 46f.) describe such change agents as key players, who acted and act as decisive drivers of diffusion processes, e.g. when renewable energies in Germany were and still are introduced and refined. These pioneers obtain specific knowledge and are very willing to take risks in order to make technical prototypes usable (in the field of wind power plants, biogas plants or photovoltaic rooftop plants), and to develop them for the operation of renewable energy production plants.

So, what is the role of change agents in transformation processes, and how can they be supported? To approach an answer to this question I refer to the multi-level perspective (MLP) presented by Geels and Schot (2010) and further developed by Göpel (2016) (see figure 6).

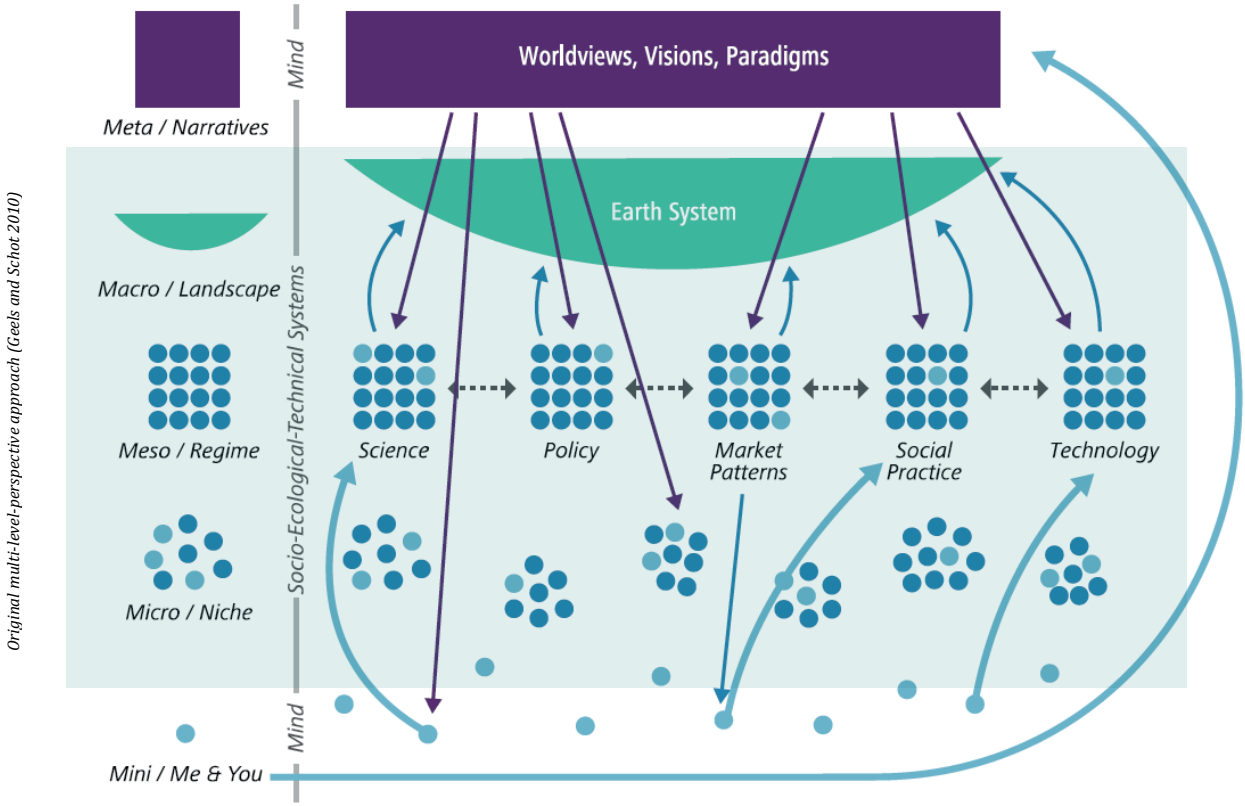

Figure 6: Mindsets in the multi-level perspective on transformations. Source: adapted from Göpel (2016: 47), originally from Geels and Schot (2010)

To present the approach briefly: the MLP assumes that radical innovations first develop in *niches* (on a micro level), which are still largely outside of the generally perceived realm and are supported by a small number of individual, collective, or corporate actors (described above as agents of change). These niches are closely related to given socio-technical *regimes* (at the meso level), which are characterized by more or less established actor constellations, rules and conventions, as well as economic and technical structures. These regimes can be influenced and transformed by niche innovations; conversely, they can also influence the niches and co-determine their development. The socio-technical regimes, in turn, are embedded in and influenced by so-called *landscapes*, as more permanent and overarching macro-level frameworks. Dynamics at the landscape level, e.g. fundamental social trends such as globalization and individualization, or general developments such as global climate change or large-scale species extinction, cannot be directly influenced by the actors involved. With regard to the role of change agents it is important to realize that they work in small networks and support innovations on the basis of shared expectations. Selection, consolidation and channeling processes create windows of opportunity in which new configurations assert themselves and lead to adjustments in the regime.

Göpel (2016) extended this much-used approach by including two further layers that refer to "mind". Here the transformative potential of the agents of change on levels other than the niche level becomes visible: on the mini level of *individuals*, which "makes up any institutional setup," Göpel (ibid.) introduces "me and you", and on the meta level of *mindsets* she refers to narratives, visions, worldviews and paradigms. This meta level, according to Göpel, mediates between all the other levels (ibid.: 47). The most important role of these mindsets, however, is to provide new imaginaries and counter-narratives necessary to ignite change initiatives and galvanize support for them. She (ibid.: 51) suggests that such an amended MLP could indicate how mindsets mediate between agents and structures, and how the dominant paradigm functions as a reference framework for justifications and narratives of change. In Göpel's view (2016), the link between the mini and meta level shows that each individual is constantly involved in shaping the future paradigm. By providing reasons, opinions, arguments and experiences, as well as non-verbal reactions and behavior, every human being is able to participate in paradigm shifts and thus in changing reality. She goes on to argue that "by embedding humans into systemic models like the MLP and multi-phase concept we can see that even when we are talking about global transformations, the source of intentional change is human thinking, feeling, and acting. SETS's[8] are created, ordered and stabilized through human decision-making and (often) conscious creation of regime structures" (ibid.: 50f.).

In view of the limited effectiveness of intergovernmental efforts, which are mostly top-down, and questions about the capacity of national governments to affect change, Hajer et al. (2015: 1656) strongly recommend mobilizing and supporting agents of change from various fields: "While in many countries, governments are retreating from the direct provision of public goods […], the energetic society steps in and provides public services ranging from the creation of more green areas through local energy provision to the provision of knowledge and information, for instance through citizen science. At the same time, these agents of change often do not find sufficient support from international and national policies. National governments are still in a learning process of how to most fruitfully facilitate and engage with the energetic society. Such an engagement would require governments to remove regulations that undermine efforts for sustainability and provide an enabling and regulatory framework that supports the actions new agents of change are taking in an energetic society". Wolff et al. (2018: 7) argue in

[8]Socio-ecological-technical systems (Göpel 2016: 18): "Political economists who engage with the systems frameworks highlight the need to understand unsustainable structural drivers embedded in current economic processes and the effects of increasing marketization and commodification on systemic governance proposals. They would apply these to both the socio-technical and socio-ecological relations and thus I grouped them into socio-ecological-technical systems."

the same vein; in their view, the role of transformative environmental policy is to identify and promote different agents of change as drivers of change. TSc has also recognized the need for different actors (not just political actors) to come together and experiment with (social) innovations, and 'lab-based processes' have been initiated. The UN Environment (2019: 584) lists "social-innovation labs (Westley et al. 2012), resilience labs (Frantzeskaki et al. 2018), transformation labs (Charli-Joseph et al. 2018, Zgambo 2018, van Zwanenberg et al. 2018), living labs (Budweg et al. 2011, Hooli et al. 2016), including urban living labs (Cosgrave et al. 2013, Voytenko et al. 2016) and transition arenas (Loorbach 2010)". All of these different labs exhibit some characteristics of TSc methods' (ibid.). Building on these findings from the current scientific discussion I conclude that agents of change as actors within the niches are most worthy of support from TSc, since their actions — but also (perhaps even more importantly) their mindsets and the narratives they shape — are likely to induce changes on the regime and landscape levels, and even on the macro level of worldviews. Such processes are supported by TSc, which, in addition to scientific ex-post studies, provides an increasing number of ex-ante studies, showing how change processes can be designed, adapted and reflected upon. These indicate the requirements for success and thus help to guide actions (Kristof 2021: 7). With these assumptions in mind, I argue that it is an important task of TSc to identify agents of change and give them adequate support.

In the following section I elaborate on how I applied the HSDA within German RECs so as to 1) support REC members as agents of change in the energy field and 2) test the HSDA as a tool to support such pioneer actors. The chain of arguments presented in this sub-chapter has not been published by the EnGeno team in such detail in any previous publication. The reason I have devoted more space to explaining in detail why I believe TSc should support change agents as drivers of transformative change is that in the EnGeno research project we explicitly aimed at supporting members of renewable energy cooperatives as agents of change. Drawing on the insights in the field of TSc accrued since then, this in hindsight successful and fruitful decision in 2015 deserves an ex-post explanation and justification and thereby provides a helpful generalization for further research. In this respect at the very least, the EnGeno team turned out to act as change agents themselves.

4.2 Needs fulfillment in German renewable energy cooperatives

In this section, I focus on the empirical application of HSDA: I actually used HSDA in practice when conducting workshops. Building on the argument that one lever for driving transformative change is to support agents of change, I will highlight the experiences I have had in applying HSDA in German renewable energy cooperatives (RECs). But to first approach the field of German RECs and to introduce them in this section before looking at the HSDA application, I refer to two quantitative interview studies that I conducted with colleagues as part of the research project EnGeno in the work package "Energy cooperatives and sustainable quality of life" (Lautermann et al. 2017). We started with a survey of data on the level of awareness of RECs among non-members. The results of this survey were published in Masson et al. (2015) (see summary article 3) and investigated the willingness of non-members to engage in RECs financially and with their own labor. We reflected this knowledge back to the RECs, so that they could adapt their activities to recruit new members. In addition, the results of the survey enabled policymakers to recognize and support the potential of RECs as citizen-driven enterprises. In a second

encounter, we conducted two different surveys among REC members. The first survey was conducted between April 2014 and February 2015, using a standardized online questionnaire among 258 members of local heating cooperatives and 229 members of photovoltaic cooperatives (Rauschmayer et al. 2015a). A second standardized online survey was conducted in the period from January to April 2015, among 865 members of the supraregional German REC "Netzkauf EWS eG" (Rauschmayer et al. 2015b). The results of both surveys were contrasted with the non-member survey and the results were included as socio-demographic characteristics of renewable energy initiatives in Holstenkamp et al. (2018). In the following section I will use the results of these surveys to introduce German RECs and to depict their socio-demographic characteristics and goals before presenting the qualitative studies applying the HSDA in detail.

Background of the German renewable energy cooperative development

RECs are registered cooperatives whose main purpose is to undertake activities in the energy sector. They follow the core principles of cooperatives: self-help, self-responsibility, regionality and democratic decision-making (one person, one vote). Driven by a concern for community, they are characterized by voluntary and open membership and economic participation, and they provide education, training and information (Maron and Maron 2012). German RECs range from fully citizen-based cooperatives to cooperatives in which municipalities, local banks, utilities or commercial enterprises are heavily involved (Müller et al. 2015, Klagge and Meister 2018). Such heterogeneity can also be observed in terms of their business models, the actors involved, and their size and operating areas. In 2014, most of them (76 % out of 772) had less than 200 members, operated only locally or regionally and were oriented at contributing to the energy supply of their community. The share of private persons among REC members is over 90 percent, and return on investment is generally a secondary reason for participation. Instead, in our surveys, ecological, economic and social goals of the energy transition (environmental protection, citizen participation, strengthening of the regional economy) are cited as important motives for joining RECs (Rauschmayer et al. 2015a, b). In addition, the members of the RECs surveyed are on the whole more environmentally aware than the non-members surveyed, and are more often members of environmental organizations. In essence, the RECs' activities involve the production of renewable energies within the three subsectors of wind energy, the photovoltaic sector and biomass local heating projects ("bioenergy villages"). The spread of RECs has been shaped in particular by the subsidy regimes and cost developments in the individual technologies. From 2006 to 2013 they experienced what might be called a 'start-up boom', but as the political environment became more uncertain, the number of newly founded cooperatives slowed down again: drastically from 2014 onwards but beginning already in 2011 (see figure 7).

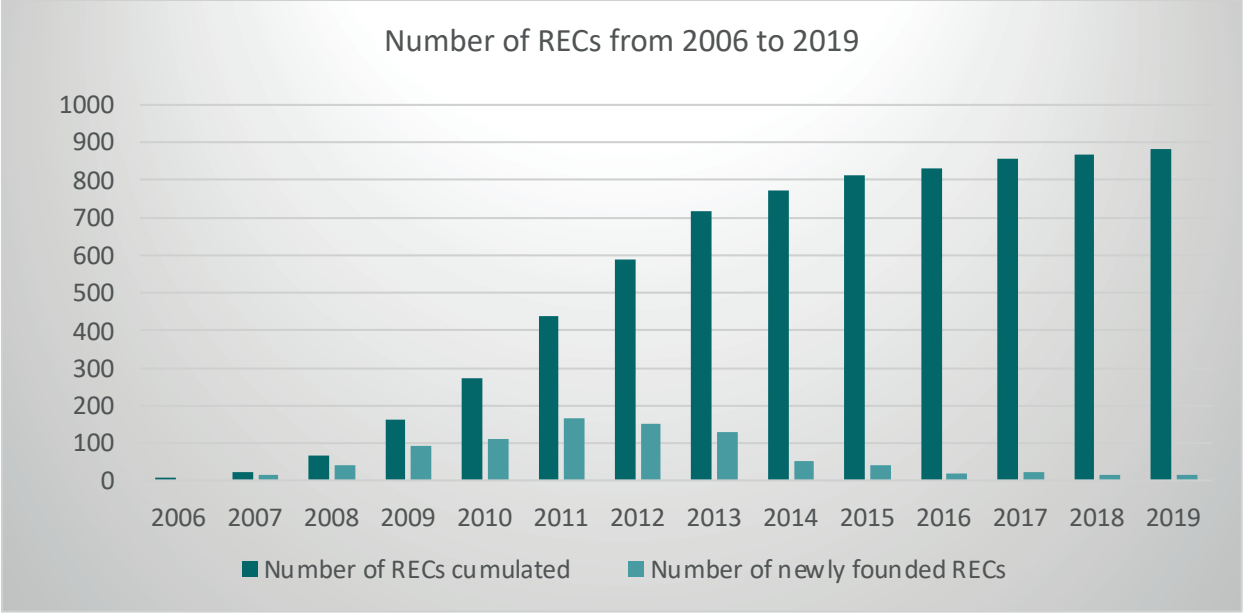

Figure 7: Annual registration of RECs between 2006 and 2020. Source: adapted from DGRV (2021)

These uncertainties are mainly related to the amendment of the Renewable Energy Law (EEG, entry into force in 2000) in 2014, as the favorable feed-in-tariffs (FITs) — previously guaranteed by the EEG — were phased out. Given the general political declaration of wanting to promote citizen participation and cooperatives, and given the attribution of diverse transformative potentials (Viardot 2013, Yildiz 2014, Huybrechts and Mertens 2014, Brummer 2018), expectations were high that the adapted legislation would seek to strengthen decentralized citizen-driven initiatives. However, the opposite was the case: the reforms of the regulatory framework for the renewable energy economy threatened the survival and further development of existing RECs as well as the establishment of new ones. Based on an assessment by the EnGeno project advisory board, the EnGeno partners published a position paper[9] in September 2014 outlining the expected negative effects of the EEG amendment. The central assessment was that a gigantic wave of bureaucracy would roll in on RECs, and they would lose the calculation basis for their business models. In particular, start-ups that had not yet been able to professionalize themselves sufficiently would be negatively affected. In response to the debate about the problems and challenges of the EEG amendment in 2014, a by-law was passed in 2016 that made it easier for RECs and other smaller market participants to take part in tendering procedures, and also relaxed some of the restrictions and requirements imposed (BMWI 2016). Nevertheless, the start-up boom was halted.

Article 3 (Masson et al. 2015), that will now be presented, has to be seen against the background of these tensions, as it was published at a time when RECs were developing rapidly and were regarded as having enormous potential for a bottom-up citizen-driven energy transition, while at the same time political conditions were threatening to slow down their development. The article starts by tracing the transformative potentials attributed to German RECs. In 2015 we concluded: Despite the continuous growth of their number from 2009 on, a significantly larger proportion of the population will have to be persuaded to participate in projects such as RECs if citizen energy projects are to play an active role in shaping the energy transition, as they are expected to do. The article therefore examines the prominence of RECs and the way they are perceived and evaluated, as well as their financial and civil society potential. The aim was to investigate how likely it is that non-members will participate in RECs, and how they can be encouraged to do so. Since earlier studies mainly focused on the motives and attitudes of REC members (Debor 2014), Masson et al. (2015) expands the knowledge about the willingness and motives to participate in a REC by providing information about non-members.

[9] https://fdokument.com/reader/full/brgerbeteiligung-a-energiedemokratie-a-dezentralitt-kernziele-2017-03-23 (last accessed June 15, 2022)

SUMMARY ARTICLE 3

Masson T, Centgraf S and Rauschmayer F (2015): Mitglieder-Zuwachspotenzial für Energiegenossenschaften in Deutschland? *Zeitschrift für das gesamte Genossenschaftswesen* 65, 191–208. https://doi.org/doi:10.1515/zfgg-2015-0304 (Appendix A.3)

Transformative potentials attributed to German renewable energy cooperatives

In literature, RECs are seen as having several benefits and the potential to promote a sustainability-focused transformation of the energy system. Thanks to core principles such as participation and proximity to citizens, but also democratic principles, they are seen as having advantages for other political, economic and ecological target areas as well (Maron 2008, Viardot 2013). The literature assumes that cooperatives can help to activate financial, ideational and knowledge resources of citizens (Huybrechts and Mertens 2014, Yildiz 2014). It is also assumed that by involving citizens, RECs reduce the risk that citizens will block projects, since justified objections to certain projects (for example due to nature conservation considerations) can be considered in the entrepreneurial processes. Even though financial participation in RECs is linked to disposable money, their low share prices entail that they can potentially distribute the monetary gains of the energy transition more broadly than other forms of enterprise. Finally, the involvement of RECs has been witnessed to a strengthening of regional economic cycles and services of general interest.

The article examines perceptions and evaluations of German RECs within a representative survey among non-members, presenting the social structure of respondents willing to participate. As such it clarifies the extent and regional distribution of willingness to invest as a basis for estimating the potential of RECs to finance the energy transition. Building on the results, RECs can adapt their membership recruitment strategies, and policy-makers can adapt their funding strategies.

Willingness to participate and implications of the results for renewable energy cooperatives and energy policy

The results indicate that the German population generally has a positive attitude towards RECs and sees these relatively young protagonists in the German energy landscape as having significant potential to support the energy transition. Just under 14 percent of the people surveyed can imagine becoming members of an REC or are even already considering it. The main target groups for joining an REC are educated and wealthier than average and are people who are already involved in other civil society organizations. This is in line with the participation structure (the people involved in operating RECs are predominantly well-educated, male, aged over 45 on average, and have above-average incomes). The target group and the characteristics of people already participating in a REC show that it will be difficult to tackle the participation deficit of other parts of the population. The safety of the investment and the level of return seem to be mostly irrelevant as reasons for joining a REC; instead, environment protection, stability of energy prices and the participation of citizens in the energy transition are mentioned to be the most important reasons for willingness to join an REC.

The article derives three main implications from the findings: 1) In terms of participation potential, the recruitment of people who are less likely to participate remains a challenge for RECs. One possibility to involve hither-

to underrepresented parts of the population would be specific information and communication offers. 2) The expressed willingness to get more involved in RECs could possibly fizzle out due to increased pressure for professionalization. It can be assumed that as a result of changes in the political framework conditions (especially the amendment of the Renewable Energy Sources Act), the importance of voluntary commitment (on which the organization of the operational processes in smaller RECs is essentially based) will be reduced in favour of full-time activities, for example through the recruitment of appropriate personnel or processes of market adjustment (probably resulting in the decrease of the number of small RECs). 3) With regard to the investment potential, the article concludes that RECs, especially those with visible local or regional manifestations, have the potential to support the financing of the energy transition, but that the results of the survey (willingness to invest 1,000 euros) fall short of the capital that is actually invested (average of 3,300 euros).

The article concludes that the mobilization of new members to join an REC depends heavily on the provisions in the EEG and other amendments. These have had a detrimental effect on the work of RECs, as the conditions at the time of the article's publication made new investments very difficult.

The added value of needs fulfillment in German renewable energy cooperatives

In further, qualitative research within the framework of EnGeno, we built on the quantitative preliminary studies (Lautermann et al. 2017). Knowing about the difficulties REC members faced in the context of the amendments to the EEG and their voluntary involvement, our normative goal was to strengthen RECs, or rather, we focused on how REC members could be supported in their largely voluntary activities. The overall practical and normative objective of our TSc research was to contribute to advancing the transformation of the energy system. For this purpose, we considered it helpful to support and strengthen RECs as democratic actors at niche level, enabling them to influence the regime with their activities (see section 4.1). From this systemic perspective, we assumed that linking the organizational level with the individual needs (FHN) of REC members (HSDA) increases the quality of life of members and thus their willingness to participate. This increased willingness to participate and satisfaction in turn helps RECs to become robust organizations, which contribute to the transformation of the energy system in the long run (see figure 8).

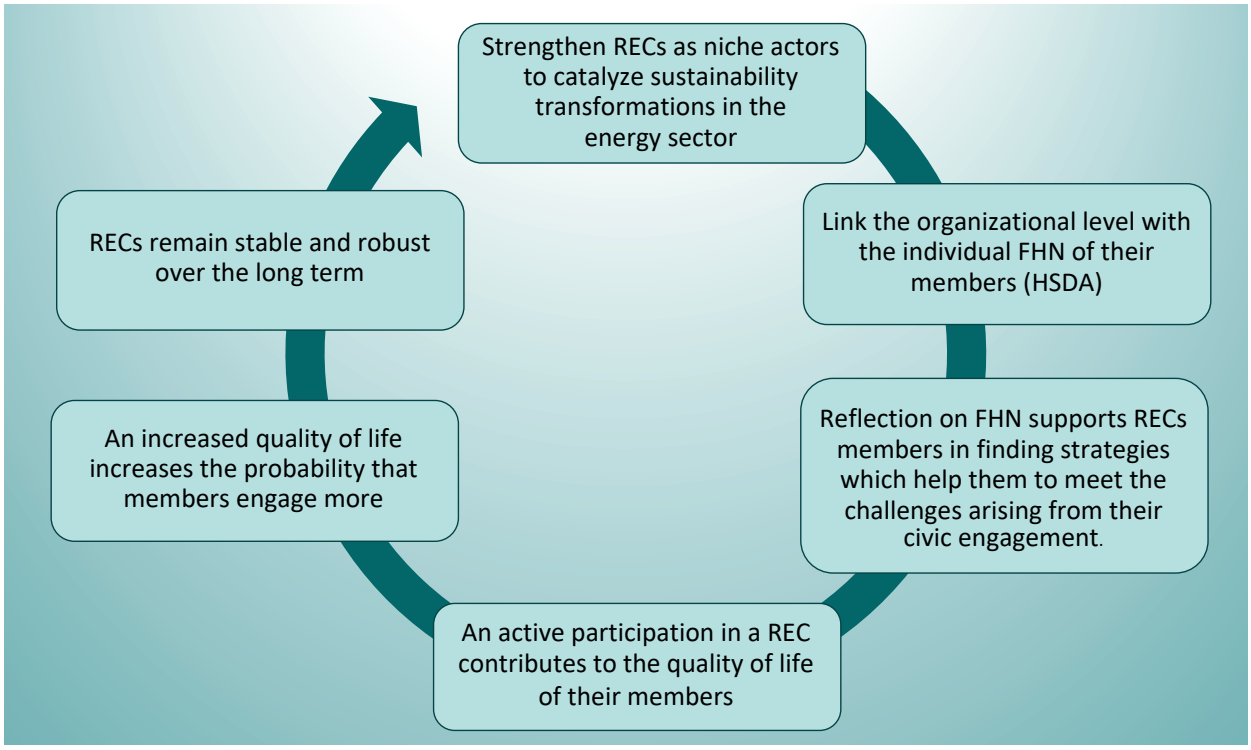

Figure 8: Justification/rationale for supporting REC members based on their fundamental human needs

Within Centgraf (2018a), published in the journal *Energy Research and Social Sciences*, I describe in detail the application of the HSDA in participatory workshops conducted in three German RECs. As research on RECs has so far mainly focused on entrepreneurial adaptations and innovations, this publication highlights the human dimensions of REC membership. To do so, I invited REC members to reflect on the challenges and potentials of their own involvement, starting with their individual needs. I assumed that each person's personal commitment to RECs is matched by a fulfillment of their individual needs. The study's rationale was therefore that a needs-based perspective might contribute to developing new strategies to help the members of RECs, individually and collectively, to meet the challenges arising from their civic engagement. Hence, REC members first reflected on the main challenges they were facing in their everyday organizational efforts, which impeded the satisfaction of needs; second, they reflected on the potential benefits resulting from their involvement, and the factors that supported the fulfillment of their needs; and third, they identified synergic satisfiers that encouraged their civic engagement. After presenting the summary of the main content and results of the article, I will briefly discuss the situation of RECs and their role as niche players in the transformation of the energy system today.

SUMMARY ARTICLE 4

Centgraf S (2018a): **Supporting civic engagement in German energy cooperatives — Transdisciplinary research based on the reflection of individual needs.** *Energy Research & Social Science* **44, 10/2018, 112–121. https://doi.org/10.1016/j.erss.2018.05.003 (Appendix A.4)**

Challenges posed by the rapid emergence and citizen-led structure of German renewable energy cooperatives

This empirical article is exploratory in nature: it does not claim to construct a theory of challenges and potential solutions for REC members, but provides preliminary insights into three cases in which REC members reflected on their individual and collective human needs to find strategies for further development of their respective RECs. The article aims at establishing how a transdisciplinary approach can support the members of renewable energy cooperatives in their largely voluntary activities. It starts with a literature review on the rise of German RECs, then describes the challenges to their stability arising mainly from the following three threats: 1) RECs need to maintain the initial motivation of the responsible board members, who are mostly voluntary workers, whilst the permanent employment of paid staff is usually too costly; 2) progress in the energy market requires frequent adaptation of the business model used, yet most RECs lack the know-how and the ability to react quickly enough; and 3) RECs may lack equity capital, a factor which hampers their economic growth, and recruiting new members turns out to be difficult as most highly engaged citizens have already set up or joined RECs. An urgent need has therefore been identified to mobilize citizens who have so far not been active (Müller et al. 2015). The main aim of the study was to develop appropriate practical strategies to address these challenges.

Applying the adapted HSDA as a means to support REC development

The needs-oriented Human Scale Development approach (HSDA) seemed to be an appropriate means to support civic engagement within a transdisciplinary research framework. The article argues that the needs perspective can contribute to developing new strategies that help initiatives to remain stable and robust over the long term. This contribution is possible, because the needs perspective allows REC members to a) explore current challenges, b) identify developments that promote the cooperative's goals, and c) elaborate specific steps for achieving these goals in the selected cases. The article presents the methodology of the HSDA and describes adaptations that were implemented to make it even more useful for generating practical knowledge. To improve the results achieved with the HSDA workshops and to evaluate the success of the project, supplementary interviews were conducted in two phases of the study: semi-structured interviews were conducted with selected participants in preparation for the workshops, to gain initial information about the RECs and to build trust. A second set of interviews with the same interviewees was conducted after the workshops, to ascertain the status of implementation of the measures developed and to enquire about the impact of the workshop on the RECs.

Internal and external challenges impeding needs fulfillment; strategies to face them

The results indicate that the challenges are inhibiting factors, which not only jeopardize the groups' shared objectives but also adversely affect the emotional well-being of those who are actively involved. Mostly confirming the challenges described in literature, REC members internally are confronted with several factors that impede needs fulfillment. These include a lack of financial resources, a lack of (active) members, a lack of time, and a lack of opportunities to reflect on their activities and to develop visions for the future beyond the technological development of the project. This is countered by the visions that drive REC members and motivate them to stay involved, such as the idea of working together cooperatively within society in a broader sense. The strategies identified, which were broken down into concrete work steps, refer both to adjustments within the RECs and to desired changes outside their own organizational unit (such as increased cross-regional cooperation with other RECs).

SUMMARY ARTICLE 4 CONT.

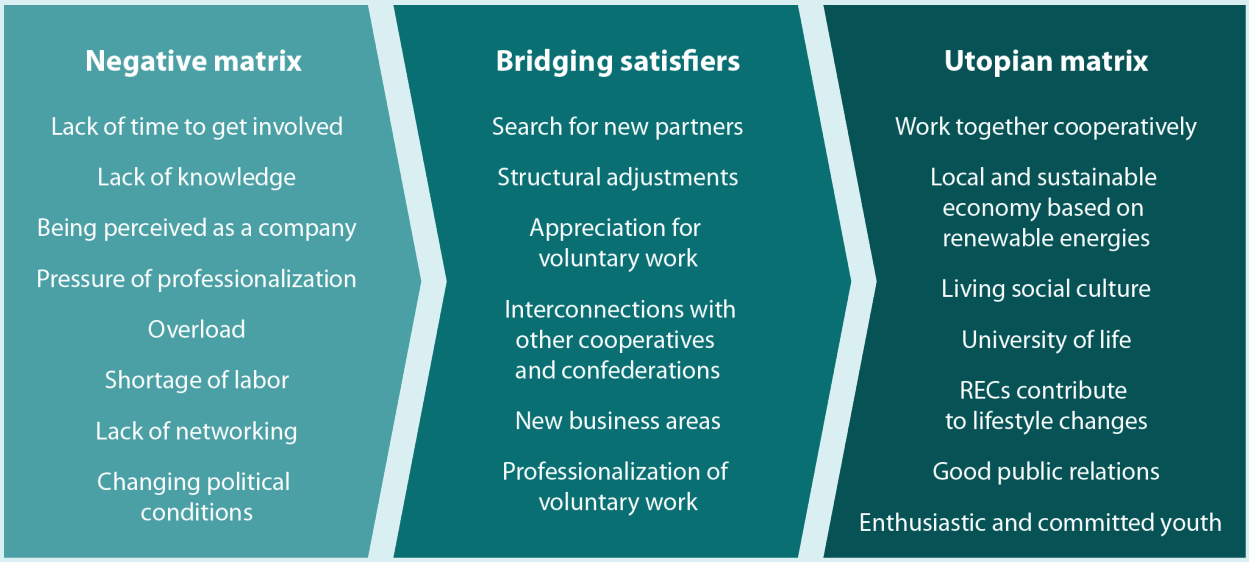

Figure 9: Compilation of main threats (factors that hinder needs fulfillment), main utopian visions (factors that would ideally fulfill needs) and synergic satisfiers for further development

Added value of applying the HSDA perspective

By applying the HSDA with its needs perspective, this study was able to demonstrate a new point of access to the field of RECs, which is usually dominated by technological issues. When people are invited to reflect (jointly) upon their fundamental needs, even in such formalized settings as RECs, they go back to the "human scale" and understand that realizing their needs has an impact on what Max-Neef et al. (1991) call the *Eigenwelt, Mitwelt, Umwelt* and, as I added, *Nachwelt*. Looking at the human dimensions of civic engagement in RECs opened up a new perspective, illustrating that, for example, longer-term negative developments in engagement can lead to frustration, helplessness and a feeling of being overstrained. Because the day-to-day organizational work of maintaining such a cooperative usually leaves little time to discuss undesirable developments or resolve conflicts, and the entrepreneurial mindset has to be in the foreground, there is usually no space to look at human motivations and personal needs (and possibly not even an awareness of the value of doing so). The HSDA interventions opened up the opportunity to find out what individual members think, how they feel and what they need. Based on this, workshop participants explored the social and personal factors that would promote better recognition of their needs. They not only identified synergic strategies to address the obstacles, but also experienced motivation for and a sense of meaning their engagement through the collaborative process.

Since the publication of the article, more than six years have passed. What has been the development since then, which new insights have to be added? The example of RECs shows how the promotion of potential sustainability transformations originating in niches is dependent upon political will and power. The comprehensive restrictions imposed on the development of RECs by the amendment of the EEG in 2014 and the only minor improvements in 2016 have kept the development of RECs 'on the back burner' and limited their expansion (see figure 9). Nevertheless, in retrospect, the literature indicates that RECs are seen as a "major success factor of the German energy transition and its acceptance" (Klagge and Meister 2018: 700). And it is evident, both as a result of the HSDA workshops and in the developments of the following years, that RECs are proactively using their endogenous potentials, for example by professionalizing and benefiting from each other through supraregional cooperation and networks. They develop business models that are "independent from public support and might lead to new cooperative strategies at the shifting interfaces between state, market and civil society" (ibid.: 697). However, the development of new business areas and the adaptation of their strategies to a more market-oriented environment is also viewed critically due to possible conflicts of interests: the need for orientation towards more 'normal' business models that follow the logic of growth and high dividends may conflict with the value-based motivations of individual actors, who see the cooperative model as an opportunity to restructure the energy system on the basis of local empowerment and economic democracy (ibid.: 700). At the same time, a nationwide energy transition is still the goal, and RECs are still seen as having important potential as change agents (Fischer et al. 2021, Punt et al. 2021). Fischer et al. (2021) conducted a study very similar to ours on awareness levels and willingness to participate among non-members. They concluded that there is still considerable potential for participation. It remains to be seen what form of political support RECs will be given after the recent change of German government in 2021. The coalition agreement formulates ambitious expansion targets for renewable energies, but does not mention the term 'citizen energy' (Coalition Agreement 2021). It is not yet apparent to what extent RECs, now established as niche actors of change, will benefit from political will to support them. As agents of change, however, they have so far contributed significantly to diversifying the hierarchical, centralized system, which is dominated by large actors, and to establishing smaller, decentralized bottom-up structures (Klagge and Meister 2018). Referring to Kristof (2021: 7), it may be advisable for change agents in the future to take advantage of the opportunities to influence their spheres of action, while knowing that their influence is limited in complex and evolving systems: being humble regarding the expectations in the beginning may prevent frustration at a later stage without ruling out larger impact after all.

4.3 Main contributions of this chapter to transformative science

With respect to the three main objectives of TSc, the publications presented in this chapter follow **scientific objectives** by providing 1) insights into untapped potential for member recruitment and 2) descriptive-analytical knowledge on difficulties arising from the voluntary civic engagement of REC members, as well as possible strategies to overcome these challenges. As to **societal objectives**, Centgraf (2018a) in particular provides practical and actionable knowledge by describing strategies that REC members co-produce to develop their RECs further. As a result of these practical findings, and with the objective of actively supporting REC development, the EnGeno research team published a practical guide for developing RECs (Lautermann et al. 2016). Finally, Centgraf (2018a) contributed to **educational objectives** by conducting HSDA workshops within RECs. This affected both participants and researchers on the "mini" level through skills development, knowledge acquisition, learning through experience, and self-development through new perspectives on needs.

5 THE ROLES AND COMPETENCIES OF SCIENTISTS
Self-reflexive practice within transformative science

The following chapter deepens the discussion as it zooms in on the role of the researcher as an important impact factor within TSc research. It emphasizes the often called for need for a (self-)reflexive practice within transformation research (Wittmayer et al. 2018, Fazey et al. 2018, Schneider et al. 2019, Borie et al. 2020). This need for reflexivity is also expressed as a characteristic within the educational objective of TSc in the analytical framework to assess the quality of TSc methods presented in chapter 2. I argue that TSc may be inspired by autoethnographical and action research to institutionalize (self-)reflexive practices of the researchers themselves but also within research teams as a means of adopting a critical stance or attitude towards one's own practices so as to reach a higher level of understanding.

It was an undeserved coincidence that at the moment I was planning to publish a paper on my self-reflexive practice, a call for a Special Issue was announced, which was exactly the right setting for this publication. In August 2019, the renowned Chilean economist and Alternative Nobel Prize laureate, Manfred Max-Neef, passed away. In recognition of his lifework in the field of development and environmental economics, the Institute of Economics of the Universidad Austral de Chile — Max-Neef's main academic residence — organized an international workshop on his work from which the Special Issue emerged. The fifth article of this thesis (Spiering 2022) is published in the Special Issue in the Special Issue "Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work" within the Inderscience Journal of Sustainable Development that aims at bringing together contributions from both academics and practitioners drawing on Max-Neef's scholarly work (see summary article 5). This means a lot to me, because it is a very honourable rounding off of my work in which I have dealt extensively with Max-Neef's thoughts and practical suggestions.

This publication is also a fitting conclusion in another respect. In my diploma thesis (Centgraf 2009) I suggested that it would be exciting to provide a self-reflexive description of the field research I was planning, in which the personal experiences I hoped to gain as a researcher would come to the fore. Here I referred to the work of Paul Reuber (Reuber and Pfaffenbach 2005), whom I did not know at the time, but who later became my doctoral supervisor. He subsequently encouraged me, during the work on my PhD, to adopt a self-reflexive practice regarding my different roles as a TSc researcher.

5.1 The roles of the researcher and the related competencies

In the course of the dissertation project, depending on the setting, the tasks and the timing of the project, I have taken on different roles. Within transformation literature, the roles presented by Wittmayer and Schäpke (2014) are widely recognized and are referred to within the article to understand the roles I have taken. They differentiate between the following roles:

1) **Reflective scientist:** this role comes closest to the 'conventional' researcher, who imparts (disciplinary) expertise, observes, analyzes and reflects, but does not actively intervene in the process surveyed.
2) **Process facilitator:** the researcher facilitates the learning process by initiating, designing and implementing co-production. He/she supports cyclical learning processes and is part of the dynamics (Pohl et al. 2010: 277).
3) **Knowledge broker:** the researcher mediates between different perspectives and actively engages to make sustainability relevant to different stakeholders and to bring about solutions.
4) **Change agent:** the researcher engages and participates explicitly in solutions-oriented research; he/she motivates and empowers participants, e.g. to address local (sustainability) challenges, and is, by defining it, part of the problem and the solution.
5) **(Self-)reflexive scientist:** the researcher engages in a self-reflexive practice with regard to his/her own positionality and normativity and is thus able to address ethical implications or potential role conflicts. He/she is likely to experience personal transformation during the research process (Wittmayer and Schäpke 2014).

Sarkki et al. (2013) added a further role to this schema: that of **capacity builder**. In this role, the researcher trains and empowers the participants to implement the co-production process independently.

A major challenge within my whole research process was related to these different roles. I had to become aware of the different roles and switch, rotate and vary accordingly and in some cases had to communicate and even defend this within academia and also towards practitioners. I positioned myself with regard to the various roles and was positioned by others. Different expectations — by myself and from others — of my 'role as a scientist' conflicted with my 'role as a transformative or transdisciplinary scientist'. Realizing this gave me a clearer view of ethical obstacles within our research that were initially only implicitly voiced and not explicitly addressed within the EnGeno project. My experiences are consistent with descriptions of how the different roles of scientists within TSc are interrelated and interact: it is not always easy to differentiate between the various roles, as the activities performed are complex, with fluid transitions to other roles (Wittmayer and Schäpke 2014, Horlings et al. 2020). The roles described are not institutionalized but are socially constructed and thus also negotiable and subject to constant change (Wittmayer 2016: 105). They interact with each other and evolve jointly.

With the description of these different roles, it becomes clear that the tasks of researchers within TSc research processes are expanding parallel to the development or adaptation of additional methods for TSc. Thus, an important question in the context of the (self-)reflexive process is: which competencies and skills enable researchers to fulfill the roles effectively (Salgado Perez et al. 2018), and what challenges do they face in doing so (Horlings et al. 2020, Bulten et al. 2021)? In the article, I draw on the consolidated framework of key competencies presented by Brundiers et al. (2021).

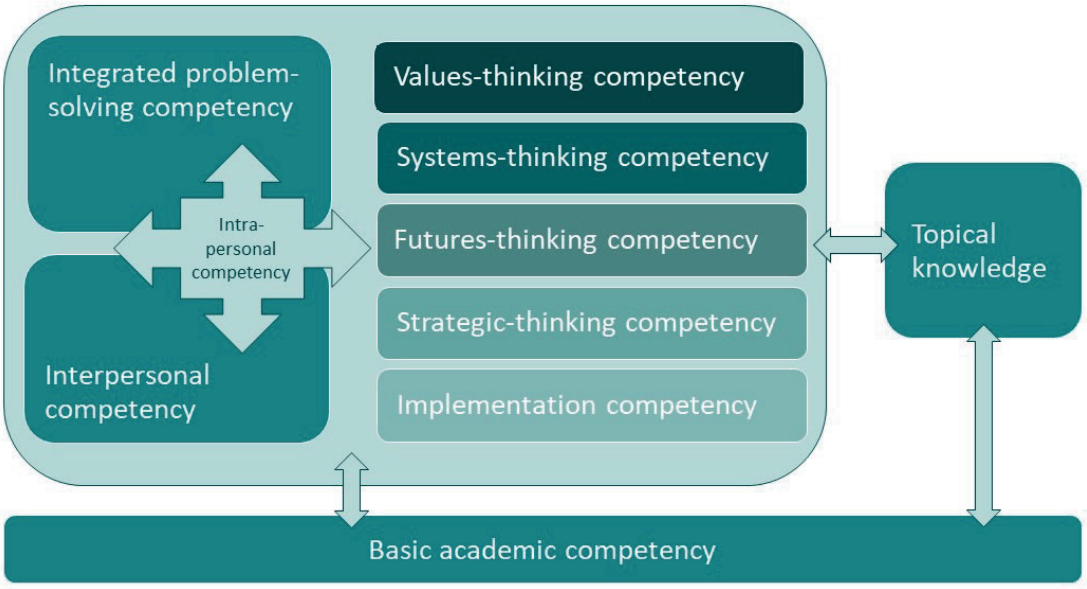

Figure 10: Consolidated framework of key competencies. Source: adapted from Brundiers et al. (2021)

I argue that this framework is useful for understanding the different competencies required for taking on the various roles within sustainability research, and as a result of my experience, I conclude that linking roles and competencies adds value to TSc processes.

Hence, the fifth article (see summary article 5) aims to expound the value that is added by a self-reflexive practice of TSc scholars, whose research is situated between science and fields of action. This entails the following questions: Which frameworks support TSc scholars in undertaking such a self-reflexive practice? Which competencies do TSc scholars acquire and develop during their research, and what is the added value of self-reflexive processes for the researchers, their individual research, and research in general? After presenting the summary of article 5, I will close this chapter by exploring the implications of self-reflexive practice for TSc scholars and the implications of broader application of the Human Scale Development approach for self-reflexive practice. After having used the HSDA throughout my PhD process in order to conduct workshops for change agents, the idea of its applicability for self-reflexive practice evolved gradually, proving the above-mentioned claim that researchers not only influence the research, thus making self-reflexivity so essential, but that they themselves also change during the process. The autoethnographic approach revealed and analyzed some of my personal experiences in a way that might make things easier for future students, researchers and/or scientists in the field of TSc.

Summary Article 5

Spiering S (2022): Self-reflexive practice through the Human Scale Development approach — competencies needed for transformative science research. Special Issue on: "Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work". ***International Journal of Sustainable Development*** **[online first] https://doi.org/10.1504/IJSD.2022.10049718 (Appendix A.5)**

Reflexivity as a quality criterion for transformative science

Within transformative science (TSc), researchers adopt different roles to promote the co-production of actionable and solution-oriented knowledge for sustainability transformations. These roles extend the 'traditional' competencies required for observation, description and analysis (Wittmayer and Schäpke 2014, Adelle et al. 2020, Bulten et al. 2021). By both initiating and catalyzing processes within their research, TSc scholars influence the research processes to a far greater extent than in descriptive-analytical research. (Self-)reflexive practice is therefore seen as a promising means and important quality criterion to explicate researchers' responsibilities and accountabilities, and to illuminate the competencies they need in order to fulfill their demanding tasks. Thus, it is a key challenge of TSc to integrate certain forms of reflexivity regarding intended and unintended results of the research process (Wittmayer et al. 2018).

Autoethnographic-sensitive lense and Human Scale Development approach to undertake a self-reflexive practice

In the article, I argue that self-reflexive practices within TSc can be enriched by autoethnographic approaches. These have a long tradition as a reflexive method in the social sciences (Ellis and Bochner 2000, Butz 2010), with autoethnographers acknowledging their direct influence on research. Research is made intelligible by questioning positionalities and examining the researcher's relations to the research object (Harding 1989). In this process, subjectivity and emotionality take on a significant role rather than being suppressed or disabled. Self-reflexive practice is demanding: it requires practice, training and a willingness to question aspects that are usually taken for granted. But it also enables the researcher to understand him/herself as part of the dynamics he/she is trying to change.

I propose the Human Scale Development approach (HSDA) of the Chilean economist Max-Neef as a framework to engage in self-reflexive research practices, as I argue that the HSDA's unique needs perspective proves to be a valuable feature.

Factors that support or hinder transformative science research

Inspired by autoethnography, I draw on my own sustainability research as a PhD student. As the first part of this endeavor, I reflect on my normative positioning in relation to TSc and the values that guide my actions. By using the HSDA method I pay close attention to deprivations and potentials that I encountered and that impeded or supported the fulfillment of my needs. Juxtaposing these factors, I developed the following grouping "academic environment," "tools and resources," "abilities and competencies" and "human scale" as four main subcategories to describe potentials and deprivations during my research experience. Based on the comprehension I thus draw from my own personal reflexive practice, I identify synergic strategies that would have supported me in my research, and which might also be valuable for other TSc scholars.

Synergic factors that support TSc scholars

I clustered the synergic satisfiers in respect to four dimensions in which I perceive most need for action and also the greatest potential for change: competencies and inner transformation (as endogenous dimensions; here I could have contributed better to my needs fulfillment myself), support and resources (in respect to supervision as the first exogenous dimension) and structural changes (as the second exogenous dimension) (see table 3).

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5.2 The added value of self-reflexive practice within transformative science

Implications of applying the Human Scale Development approach for self-reflexive practice

The HSDA turned out to be a valuable tool for self-reflexive practice as a TSc scholar. The HSDA not only makes it possible to support others in their reflections, but can also serve as a self-reflexive framework. I argue that a self-reflexive approach to look at one's competencies through the lens of the HSDA was a valuable broadening of perspective, reflecting on both endogenous and exogenous factors and thus widening the scope for action in terms of bottom-up approaches. I was able to show how the researcher's normative positioning and values influence his or her decisions. Another added value of applying the HSDA as a tool for self-reflexive practice is that it offers an opportunity to take stock of deprivations and potentials within TSc research projects. Such factors can, for example, be understood as core themes for formative project evaluations such as the "reflexive monitoring in action" approach (Van Mierlo et al. 2010). A common limitation to such regular self-reflexive practices within research projects is that some project partners do perceive monitoring activities as too demanding, do not see their value or perceive the processes as "cumbersome" (Knickel et al. 2019: 12). Accordingly, it is important to clearly disclose the benefits of (self-)reflective practice and to implement the monitoring activities thoughtfully and appealingly to increase trust and motivation.

Implications of self-reflexive practice for transformative science scholars

By subjecting my research process to a self-reflexive practice with the help of the HSDA, I was able to make deductions for other TSc researchers (and in some regards even to science in general). I will roughly classify two of these implications in more detail in the following passages (see table 3).

My own experience has confirmed what is described in literature, namely that the roles of researchers are closely intertwined with corresponding competencies. Hilger et al. (2021: 2050) refer to Biddle (1979) and state that roles within transdisciplinary and transformative research are adopted consciously. However, I experienced the opposite within the transdisciplinary EnGeno research project, where we took on roles more or less unconsciously. This is in line with what Hilger et al. (2018) describe when they say that for most TSc researchers and practitioners this kind of research is new or unknown. If, as Hilger et al. (ibid.) argue, it is important to foresee which different roles a research process will require and which competencies will be needed to fulfill these roles, then TSc researchers need to be aware of the roles and respectively necessary competencies. This would increase the quality of TSc processes, as clearly explicated roles "could facilitate expectation management, mutual transparency, and clarity of roles undertaken by all actors, as well as guide the selection of professional partners and the recruitment of staff for new td [transdisciplinary] and tf [transformative] research processes" (Hilger et al. 2021: 2066). Hilger et al. (ibid.) even propose extending the concept of different roles to non-scientific research partners, as they critically question the duality of "practitioners" and "researchers" due to their overlapping and heterogeneous roles. With role allocations based on existing competencies, TSc processes can be strengthened and the necessary (time and financial) resources can be planned sensibly. The framework of key competencies presented in article 5 (Brundiers et al. 2021, see figure 10) and the overview on competencies published by Bliesner et al. (2013), describing necessary and helpful competen-

cies for sustainability change agents, seem promising approaches here. Hilger et al. (2021: 2050) conclude: "Defined roles have the potential to unburden researchers from the need to meet all these competing demands, especially when the roles have already been formulated during the planning stage of a collaboration. For non-scientific actors, defined roles provide clarity on what to expect in the collaboration and what might be expected of them".

As a condition for defining and assigning such roles, the specific challenges and requirements of TSc processes need to be examined. TSc research can be described as a "research borderland", a term that Felt et al. (2013) introduced for transdisciplinary research. The analytical framework presented in this thesis (see chapter 2) may therefore serve as a helpful tool for quality control and appropriate anticipatory research design including very prominently the consideration of the roles of the researchers.

Science needs to change to support transformative change

The second implication I draw from my personal experience relates to science as a whole. By taking a critical look at the institutional framework, I am adopting a perspective that is implicitly feminist, since it is critical of power. To carry out meaningful TSc, changes in institutional and structural conditions are needed, as is increasingly being argued by various authors (Defila and DiGiulio 2019, Fazey et al. 2020, Bauer et al. 2021). What is needed is greater recognition of the focus on practical knowledge generation in science and in research funding: reduction or elimination of career risks for TSc scholars, adapted funding programs and political support, as well as the removal of institutional barriers (such as quality control measures based solely on publication indices). What Felt et al. (2013: 523) described for transdisciplinary research also holds true for TSc: efforts are needed to introduce institutional structures that make this kind of research compatible with the norms and values in science. Such a step is necessary in order to enable TSc researchers to perceive the possible epistemic habitats as attractive enough to seriously engage in such "borderland" work and innovation practices, without having to bear the risk of the venture itself (for instance through the danger of not being recognized as a scientist or not to receive funds). Hence, when contributing to TSc, I argue that it is essential to examine power imbalances, flaws and needs for change within the current science system. Collective (self-)reflexive practices may support scholars in uncovering challenges and developing appropriate solutions among each other. An example of an influential institution that has understood the need for such reflexive processes and benefited from them is IPBES: "the importance of transformative learning and the need to establish institutional reflexive processes in which this transformative learning can take place will be critical" (Borie et al. 2020: 71). It is also recognized in action research not only that practice is changing, but that changes are needed in science itself: "Conceptually, action research must encompass both the research process and the application process. Hence, action research and action researchers have to work with developing systematic, practically based insight as an aim in itself as well, challenging how basic social research has been done methodologically and organized institutionally for the most part in the modern period. […] action research cannot just serve everyday practical concerns, and the goals of social science too, without transforming both" (Eikeland 2006: 43). Here, the question of values comes back into play: Schneider et al. (2019) argue that science should not relegate these ethical and value-based questions to the field of politics alone. On the contrary, "science must find a way of addressing them and incorporating them in a systematic and reflexive way" (ibid.: 1596). Fazey et al. (2020: 13) go even further and advocate a transformation of universities as the "longest standing human institutions on the planet": "[T]he world is entering a new era in which universities in their current form do not provide what human civilization now needs for a sustained and thriving existence on an endangered planet. Universities urgently need a renewed sense of being an institution serving the public good in a world of existential challenges. They need an unwavering challenge-orientation, post-disciplinary thinking, and an action-orientation. They need to employ experiential pedagogies and forms of knowledge creation that overcome the thinking and practices that have led to our current societal challenges while authentically being the change they seek to bring to the world".

5.3 Main contributions of this chapter to transformative science

Scientific objectives: By linking autoethnography, a feminist critique of power and the different roles of TSc researchers, the chapter and article 5 enhance the understanding of competencies needed for TSc and elucidates how to adopt and fulfill required research roles and procedures. **Practical objectives:** The chapter provides insights in the sense of *technē* into how the HSDA can be applied for self-reflexive practice. And it shows possible ways to devise solution-oriented outcomes and concrete strategies for TSc scholars, which can support not only early-career PhD scholars but also project teams in a regular self-reflexive practice. **Educational objectives:** As one of the three objectives of TSc is to achieve educational goals, I identified several supporting factors (in the sense of "synergic bridging satisfiers") as a result of my own personal self-reflexive practice. Not only would these factors have supported me in my research process; I argue that they would benefit other TSc scholars as well.

6 CONCLUSIONS: LESSONS AND OUTLOOK

This final chapter concludes the thesis by summarizing its main findings. Accordingly, I revisit my main research questions and aims and discuss the results in light of current debates and insights on transformative science (TSc). I draw on the main scientific and practical contributions of the thesis and implications for TSc before formulating an outlook for strengthening capacities for TSc methods by identifying future research questions.

This thesis is a contribution to the extensive dialogue currently taking place in sustainability science on the role of science within transformative change towards sustainability, part of which is to contribute to achieve the Global Sustainable Development Goals (SDGs) (Schneider et al. 2019, Singer-Brodowski et al. 2021). In view of the increasing demand for bottom-up approaches to deliberatively develop options for transformative change, TSc methods are becoming increasingly important. As TSc is a comparatively young research paradigm within transformation research the scientific discussion on TSc is lacking more rigorous systematization and an empirical TSc research practice that is methodologically and theoretically sound. The overall aim of the thesis was to contribute to the advancement of action-oriented TSc and its methods. Particular challenges for the recognition of TSc methods arise on the one hand from their highly normative aspiration — namely to catalyze transformative change — and on the other hand from the three different objectives TSc pursues (scientific, practical and educational). TSc thus extends 'conventional' science by two further goals, whereby the decisive challenge is to empirically substantiate practical and educational objectives. In particular, its practical orientation requires other ways of measuring scientific quality. At the same time, as pointed out by this thesis (see chapter 2), co-design and relevance to practice become central characteristics of TSc resulting from its aspiration of democratic knowledge production. To this end, this thesis contributes two main building blocks to the discussion on how action-oriented TSc, and its inclusive and deliberative methods can be advanced to support transformative change:

1) I developed an analytical framework to answer the question: what quality criteria can be applied to assess TSc methods? The framework brings together characteristics discussed in literature by Wittmayer et al. (2018), Fazey et al. (2018) and Parodi et al. (2019) such as co-design, practical relevance, democratic knowledge production, normativity and catalyzing role and integrates them within the three main objectives of TSc (scientific, practical and educational). The analytical framework can be deployed to analyze participatory bottom-up methods as appropriate for TSc and assure the quality of TSc research.

It provides a valuable basis for conceptually testing which essential characteristics bottom-up methods fulfill, where gaps exist and where adaptations might be necessary.

2) As a second main contribution, I have analyzed the fit of the Human Scale Development approach (HSDA) as a TSc method to illustrate how the framework can be applied. This allowed me to identify where the HSDA yet met the characteristics and where adaptations were necessary to increase its applicability as a TSc methodology.

I highlight the added value of the HSDA for TSc and how this method makes it possible to look at value decisions with a broader view, and thus, do justice to TSc's normative goal of promoting sustainable development, while at the same time fulfilling the democratic and reflexive requirements.

With these contributions, I have developed new perspectives within political geography and sustainability science. The following sections further summarizes the contributions of the analytical framework to assess the quality of TSc methods and the added-value of the HSDA as a TSc method.

6.1 Overall contributions and implications

Added value of the analytical framework to test the quality of transformative science research

On a conceptual-theoretical level the thesis sheds light on the challenges of simultaneously meeting the three different TSc research objectives that it wants to serve — namely scientific, practical and educational objectives. Based on a deeper understanding of the different nature of these goals, I derive a set of criteria and elaborate what is necessary to assure TSc research quality. The emphasis is on the implications resulting from their diversified nature to the assessment of TSc methods. While the scientific objective of generating descriptive-analytical knowledge can be tested with existing disciplinary quality criteria and quality control indicators, the quality of how scientific processes that contribute to the practical and educational objectives are — as social and context-dependent processes and due to their practical orientation — more difficult to assess.

To meet this challenge, a main contribution of this work centres on the development of an analytical framework that operationalizes quality criteria for TSc methods (Spiering and Barrera 2021). This framework breaks down the requirements from pursuing these three objectives for the first time. It proposes options for assessing the fit of methods as TSc methods by linking these objectives with a set of criteria. The analytical framework refers to the three types of knowledge (systems-, target- and transformation knowledge) (Lys 1997) and assigns them to the three objectives to ensure that all three types of knowledge are 'produced' by TSc methods. This implies the generation of knowledge which is descriptive-analytical in nature and serves to understand an issue, its dynamics and causal influences; and it also implies co-producing actionable knowledge about the desired future state of the system and about available ways and means of realizing the desired state of the system in practice. In order to be transformative, the thesis corroborates the need to produce these different types of knowledge concurrently. Whether methods provide descriptive-analytical knowledge or actionable knowledge and whether they serve scientific, practical and educational objectives can form a possible starting point for evaluating their future use. The analytical framework which has been developed, implemented and tested has turned out to be a versatile instrument to test the quality of TSc methods as their strengths and weaknesses can now be evaluated more thoroughly. With these findings, the thesis contributes to create scientific impact by generating, integrating, assessing and disseminating conceptual knowledge relevant to transformative change and expands the knowledge on the main aims of TSc and methodological quality criteria.

Added value of applying the Human Scale Development approach as a transformative science method

The second contribution of this research is applying the analytical framework to HSDA and testing its viability as a method for TSc (Spiering and Barrera 2021). This resulted in a conceptual contribution, which consists of adapting the HSDA so that it can be used to produce not only systems- and target knowledge, but also transformation knowledge. The original HSDA approach was not designed for such steps. Another contribution on an empirical-practical level consists of applying the HSDA in TSc research about different energy initiatives and assessing its impact both on the initiatives and on science (Centgraf 2018a). While evaluating the transformative and also the sustainability effects of these HSDA applications using the analytical framework and accordingly adjusting the procedure, an iterative process (what is needed to achieve better results and how is that best facilitated?) led to the two adaptations of the HSDA for TSc presented in chapter 3.2. This iterative process of subjecting practical research to quality criteria shows how methods for TSc can be designed or adapted. The results indicate that the analytical framework developed to test the quality of TSc methods was conducive to the analysis of HSDA as a TSc method conceptually. Findings show that the HSDA provides the following added-value for TSc:

HSDA links needs and sustainability

The thesis shows that the HSDA, with its unique perspective on fundamental human needs (FHN), enriches TSc. In fact, when linking it to sustainability, it provides an approach to reconcile personal values and impacts at the system level, while, at the same time, initiating transformation processes. Or put it differently: HSDA enables people to see how they can achieve personal goals without degrading or destroying the larger system. It does so by helping to uncover underlying values of those going through an HSDA process. This way HSDA, also promotes choices in the debate on future development strategies that can lead to synergic goal attainment. The nature of "synergic" satisfiers is to meet multiple needs simultaneously. As the thesis points out, this concept of "synergic" satisfiers, can cautiously be grouped with "sustainable" satisfiers. Thus, HSDA provides a tool for values-based (sustainability) research practice. At the same time the identification of "impeding" or "destructive" satisfiers contributes to revealing underlying unsustainable practices and challenges unsustainable "structures, systems, mindsets and cultures" (Fazey et al. 2018: 57). By extending material needs fulfillment ("having") with the non-material categories of "being", "doing" and "interacting", the HSDA "shifts the perspective of development away from economic goods towards sustainable satisfiers and ultimately decouples the concept of economic development from that of economic growth" (Kletzka 2021: 99). In order to pave the way for production and consumption practices within planetary boundaries, such "decoupling" is considered to be of great value (Schneidewind 2018, Kletzka 2021).

It is a remarkable turn of events and a change of perspective that the HSDA — originally developed in the Global South — is increasingly being applied in the Global North and informing the debate on how to support values-based sustainability transformations.

HSDA contributes to a democratization of knowledge

One of the pillars of the HSDA is to extend the ability of groups to increase their levels of self-reliance by means of a participatory methodology. The results of this research indicate that HSDA processes support empowerment and local emancipation that can lead to alternative visions and strategies diverging from 'mainstream develop-

ment thinking' (Kletzka 2021), e.g. RECs are mutually benefitting from supraregional cooperation and networks (see chapter 4.2). The approach and its pillar of increasing self-reliance constitutes a more politicized approach to participation and local agency that goes beyond mobilizing capacity for change. Instead, creating and recognizing spaces for collective bottom-up reflection on transformation will likely result in integrating values into strategy development and in more diverse visions of desired futures. Regarding transformative change, these value choices — sustainable or unsustainable strategies — play an important role. Finally, integrating values into decision making may provoke a change in values and encourages an all level inclusive thinking (from mini to meta level, see figure 6). Such holistic thinking makes it possible to trigger transformative change and contributes to the understanding of the interlinkages of the different SDGs so that interlinked — synergic — responses can be co-developed. This way, the dissertation shows how normative positioning — namely to support transformative change — can be encouraged by co-creating synergic strategies. Accordingly, the dissertation helps to fill a gap identified by several scholars (Future Earth 2013, Fazey et al. 2018, Schäpke 2018, Wamsler et al. 2020, Hölscher et al. 2021, Bentz et al. 2022): the need for suitable facilitation approaches that are able to take normative issues into account when developing instruments within democratic exploratory processes for transformative change.

HSDA serves as tool to support agents of change

This research has shown that the HSDA with its perspective on FHN turned out to be a valuable tool to support German energy cooperatives and other energy initiatives as agents of change (Masson et al. 2015, Centgraf 2018a). The empirical results disclosed that the application of the HSDA enabled a new approach to the field of German renewable energy cooperatives (RECs). This allowed to address the human dimensions of civic engagement, namely the reflection of personal and collective needs. With respect to the knowledge production for the development of citizen-driven German RECs, the thesis has generated descriptive-analytical knowledge on difficulties arising from the voluntary civic engagement of their members, as well as actionable knowledge i.e. concrete strategies, developed by the change agents themselves, to overcome these challenges. By publishing this knowledge, it has been fed back into the scientific debate. Through the need's perspective, the human dimension of civic engagement and related challenges and potentials were made visible in a field otherwise dominated by discussions on technology. Thereby, a connection between the emotional well-being of the people engaged and the entrepreneurial goals became apparent. By mutually (science and practice) devising both social and personal strategies to overcome the obstacles, it was possible to contribute to a more robust development of these initiatives in the longer term. In light of the expansion target for renewable energies mentioned by the new German three party coalition government in their coalition agreement (as of Dec. 7th 2021) and the corresponding need to increase the acceptance of renewable energy systems, such conceptual knowledge is currently highly relevant. In sum, there are three dimensions in which change agents are supported by deploying the HSDA: 1.) HSDA allows for the generation of different types of knowledge, 2.) this enables a more holistic approach as strategies range from emotional to technical levels and 3.) with its visioning and transformation phases, the HSDA provides orientation for change agents on how small and radical steps towards transformative change can be designed and implemented. However, it is also important to keep the limits of the approach in mind. The thesis confirms the position of Jaeger-Erben et al. (2018) who emphasize the need to be humble with respect to TSc research results as a practical implication for TSc research. The question arises whether, for example, the one-off HSDA workshop interventions conducted within this study are to be understood as further incremental steps (Kehrer et al. 2020) or have already developed a transformative character within the diverse energy initiatives. It is within the very nature of TSc processes to open up room for experimentation in which measures with a decidedly transformative claim can be developed, tested and implemented. Even more challenging for TSc researchers with their

pronounced and necessary sense of mission is the fact that whether a "transformative" intervention has actually taken place can only be evaluated ex-post (Jaeger-Erben et al. 2018). As this "humbleness" diametrically contradicts the initial statement of this thesis that radical change is urgently necessary, the only way of reconciling this contradiction would be to get an enormous number of humble small steps on their way as quickly as possible (Wittmer et al. 2021).

HSDA serves as tool for (self-)reflexive practice

One central quality criterion to assess practical and educational outcomes is that of (self-)reflexive practice (Beecroft 2018). As I have shown in Spiering (2022), the HSDA can also be used for critical autoethnographic self-reflexive practice. By linking autoethnography, a feminist critique of power and the different roles of TSc researchers, the thesis enhances the understanding of competencies needed for TSc and elucidates how to adopt and fulfill required research roles and procedures. As such, the thesis shows how TSc research can be informed by feminist research and autoethnography. Apart from distributing knowledge about how to apply the HSDA in different settings, the thesis thus also yields detailed insights on how to use the HSDA as a tool for self-reflexive practice as it turned out to be a valuable approach for my personal self-reflexive practice on my different roles as a TSc scholar (Spiering 2022). My experience corroborates the need — brought up by different scholars — to undertake regular self-reflexive practices within TSc projects. This becomes necessary because distinguishing between, switching between and filling the different roles is highly demanding (Wittmayer and Schäpke 2014, Horlings et al. 2020). The results of my self-reflexive practice also confirm the insights from Hilger et al. (2018, 2021) that the different roles TSc scholars take are closely intertwined with corresponding competencies. Due to this perception I refer to the consolidated framework of key competencies published by Brundiers et al. (2021) as a promising approach for education and training in terms of significant competencies both for higher education and as a training opportunity for researchers and project leaders (see Figure 10).

Drawing on my personal experience, I argue that the HSDA can be of importance for other TSc scholars in a (regular) (self-)reflexive practice. Chapter 5, not only recommends early-career PhD scholars within sustainability science to apply the adapted HSDA, but also suggests that it might be deployed as a tool for a (self-)reflexive practice of project team members, supervisors and scientists in leading positions to undertake reflexive and formative project monitoring.

With respect to my personal learning process I have acquired and expanded a wide range of skills and competencies by adapting and facilitating the HSDA workshops, providing trainings for students and colleagues to facilitate HSDA workshops themselves and undertaking as well as publishing a self-reflexive practice. It became very clear to me early on how much my different roles (as PhD student within a practice-oriented research institution, as reflective scientist, process facilitator, knowledge broker, change agent, capacity builder and self-reflexive scientist), including my own positioning, my previous experiences and competencies, my values and convictions had an impact on the research processes and thus on the results. Within the upcoming discussions on TSc in the course of the dissertation project I could make sense of conceptually arguing on how to include HSDA in the canon of TSc methods. This encompassed an examination of the goals and procedures, but also of the hurdles of this kind of research that I had experienced myself. That I was able to fruitfully apply HSDA for my own systematic self-reflexive practice was important to me as it rounded off my PhD process. It also confirmed the increasing emphasis in literature on the importance of the roles, attitudes, values, and prior experiences of researchers themselves, as these aspects often implicitly effect the research and co-production processes (Popa et al. 2015, Horcea-Milcu et al. 2019). At the same time, this self-reflexive practice revealed important implications for TSc

scholars when it comes to promoting action-oriented research. I experienced this process of being involved, following the normative agenda of aiming to catalyze transformative change, and questioning institutional frameworks as not being low-risk e.g. by being exposed to criticisms for such positioning as agent "at the boundary between the sphere of science and policy" (Milkoreit et al. 2015: 87). This experience goes in line with risks and challenges such as the risk of the credibility and authority of science being undermined by its direct involvement in value-laden discussions (Van der Hel et al. 2018:249) or even career risks for TSc scholars, described in literature (Alsop 2002, Milkoreit et al. 2015, Van der Hel et al. 2018). Enduring uncertainties, complexities, and engaging in open-ended processes are capabilities I have developed over time. They characterize a stance that I assume will be important for myself but also for others in future efforts to promote transformative change.

In the following section I will draw an outlook on how to build on the insights presented in this thesis.

6.2 Outlook

There are a number of potentially fruitful avenues for future research that could build on the findings of this thesis. In this section I derive some implications of my results for science and science funding and outline on which further research could build upon.

The study sheds light on the implications of aligning science with the normative goal of contributing to transformative change. By bringing into focus and illuminating the imbalances between knowledge and action taken, my work's findings reveal options for TSc scholars to jointly contribute to a more reflexive and critical understanding of scientific knowledge production. This is possible not least through a flexibilization and sensitization of the science system so that it can embrace normative sustainability science and successfully apply forms of participation in mutual knowledge production processes with science and practice.

Based on the feminist extension presented in chapter 5, this dissertation addresses power structures within scientific institutions. In doing so, it offers critical impulses that go beyond the TSc methods studied and the issue of applying HSDA in the context of energy initiatives. One aspect that is critically examined, is the different and highly demanding roles of researchers in TSc processes. Linking these multiple roles to the required competencies highlights gaps in the training of TSc researchers and the lack of further training and supervision in the field of TSc projects. However, this connects to the under researched debate about boundary management and the limits of what is responsibly achievable and irresponsibly over-demanding for TSc scholars (Jäger-Erben et al. 2018, Hilger et al. 2021). The thesis also questions the current institutional framework at universities and research institutions regarding their means of support for TSc research. Short project durations, output orientation and lack of scientific recognition among others make it difficult to successfully reconcile practical and scientific objectives. To address this flaw, TSc could build on what Defila and DiGiulio (2020: 64) spell out for real-world laboratory (RwL) research when they provide ten recommendations for funders: these include among others a call to "take the format seriously", "operate, related to the RwLs format, a management of expectations that is both realistic and differentiated" and "establish and maintain funding procedures and funding conditions that are adapted to the RwLs format". How such recognition can be shaped in detail, remains an open task and future TSc research can fruitfully tie in here.

Another avenue for future research may lie in the development of concepts and methods to better evaluate the scope of TSc's impact and to indicate how the knowledge from the individual case studies can be 'upscaled'. The latter question is one that is relevant to TSc more broadly and thus conceptualizing the transfer of knowledge as well as the scope and scale of impacts in TSc remains an open task (Adler et al. 2018, Jäger-Erben et al. 2018). However, the importance of many small and radical changes as a condition for transformative change has to be acknowledged (Wittmer et al. 2021). Here, as shown, the HSDA with its focus on needs can open important perspectives by developing, in addition to material 'need satisfaction', ways to fulfill human needs on the levels of being, doing and interacting, thus contributing to the design of a 'good life'. By developing endogenous factors that leave the power of design with the people who develop the strategies, it is more likely that they are implemented and their transformative potential unfolds. Hence, a possible area of future TSc research would be to apply the adapted HSDA presented here outside the field of energy-services, e.g. with other change agents such as agricultural cooperatives, initiatives or networks that promote economy toward the common good or with decision makers on higher policy levels or company management boards.

When designing and implementing interventions one must take into consideration that significant resistance to the necessary radical transformative change is to be expected by powerful actors who benefit from the current system (Wittmer et al. 2021). An extended focus on power structures, power asymmetries and resistance to change form highly important future research areas (IPBES 2021: 140). The HSDA could provide interesting entry points to identify, understand and transform inertia and resistance to change. For such an endeavor the open access facilitation manual explaining two options for HSDA adaptations published in the course of this dissertation offers a guideline to other TSc scholars.

Within this final chapter I wrapped up the main findings of the thesis, namely the merit of integrating the normative value of sustainability into science, the provision of an analytical framework to test the fit and quality of TSc methods as well as the added value that a needs-based reflection and development of synergic strategies using the adapted HSDA provides for TSc research. HSDA is not a silver bullet, but it constitutes a powerful approach for TSc to catalyze values-based actionable knowledge for transformative change and more importantly, to induce mindset shifts for envisioning sustainable futures or sustainability 'futuring'.

Considering this background, a politically ambitious sustainability science can take on the task of entering a dialogue with civil society organizations, political actors, the media, but above all with funding institutions, scientific institutions, and scholars at all levels. Through the means of HSDA processes all the above-mentioned groups could work together. Promising in this respect are joint efforts of funded research programs for a scientific landscape that recognize the value of normative positioning and pursue the mutual goal of catalyzing transformative change based on the fulfillment of human needs.

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Appendix A: Overview of scientific publications

Appendix A.1 **Spiering S** and Barrera MdV (2021): Testing the quality of transformative science methods: the example of the Human Scale Development approach. Sustain Sci. https://doi.org/10.1007/s11625-021-00966-3

Appendix A.2 **Spiering S** and Barrera MdV (2020): How to?! Practical knowledge for transformative science — facilitation guidelines for two applications of the Human Scale Development approach. UFZ Discussion Papers, 3/2020. Leipzig: Helmholtz-Zentrum für Umweltforschung – UFZ, ISSN 1436-140X https://doi.org/10.57699/a3y9-gd49

Appendix A.3 Masson T, **Centgraf S** and Rauschmayer F (2015): Mitglieder-Zuwachspotenzial für Energiegenossenschaften in Deutschland? Zeitschrift für das gesamte Genossenschaftswesen 65, 191–208 [abstract only]. https://doi.org/doi:10.1515/zfgg-2015-0304

Appendix A.4 **Centgraf S** (2018a): Supporting civic engagement in German energy cooperatives — Transdisciplinary research based on the reflection of individual needs. Energy Research & Social Science 44, 10/2018, 112–121 [abstract only]. https://doi.org/10.1016/j.erss.2018.05.003

Appendix A.5 **Spiering S** (2022): Self-reflexive practice through the Human Scale Development approach — competencies needed for transformative science research. Special Issue on: „Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work". International Journal of Sustainable Development [online first] https://doi.org/10.1504/IJSD.2022.10049718

Appendix A.1

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ORIGINAL ARTICLE

Testing the quality of transformative science methods: the example of the Human Scale Development approach

Salina Spiering[1] · **María del Valle Barrera**[2]

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Abstract
Scholars and funding bodies alike are increasingly calling for transformative research that delivers socially robust and impact-oriented outcomes. This paper argues that the Human Scale Development approach (HSDA) introduced by Max-Neef and colleagues in Latin America during the 1980s can serve as a method for transformative science (TSc). HSDA is both a theory and a participatory methodology and thus contributes toward fulfilling the objectives of TSc, which are scientific, practical and educational. In this paper, we begin by explicating how the fundamental human needs (FHN) approach of the HSDA can support scholars and practitioners alike in addressing complex sustainability challenges. We then refer to the methodological adaptations to the original proposal that we have previously developed to illustrate how Max-Neef's methodological approach might be further extended and to demonstrate how these changes can strengthen HSDA and make it even more useful for generating knowledge needed in sustainability transformations. To inform and support research that builds on the co-production of knowledge, we test HSDA with regard to TSc quality criteria and show how it adds value to the existing canon of TSc methods. To this end, we develop an analytical framework that can be deployed to assess the quality of TSc methods.

Keywords Human scale development approach · Transformative science · Transformation research · Transdisciplinary methods · Quality criteria · Stakeholder involvement · Participatory processes

Introduction: The Human Scale Development approach as a methodology for transformative science?

Tackling "wicked" environmental and societal problems that hinder sustainable development requires a reconsideration of how and what kind of knowledge is generated (Köhler et al. 2019; Bergmann et al. 2021). Caniglia et al. (2020) state that "sustainability science needs more systematic approaches for mobilizing knowledge in support of interventions that may bring about transformative change". We argue that the Human Scale Development approach (henceforth HSDA) provides several entry points for addressing complex sustainability challenges and that it supports transformative change. First introduced in 1991 by Chilean economist Max-Neef et al. (1991), HSDA promises to offer a conceptual and methodological framework that enables researchers and participants jointly to "paint a picture" of current—or desired future—conditions based on the satisfaction of human needs. It provides a robust theoretical basis that is grounded on a broader understanding of "human needs" than neoclassical approaches such as the satisfaction of material needs, the marginal utility of consumption, the Unsatisfied Basic Needs Approach (Feres and Mancero 2001) or the World Bank's income poverty measures (Altimir 1982). The intention pursued by Max-Neef and colleagues was to "make a theory of human needs understandable and operational for development", as "human needs are discerned differently according to the ideological and disciplinary lens of the

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✉ Salina Spiering
salina.spiering@ufz.de

María del Valle Barrera
mvallebarrera@gmail.com

[1] Helmholtz Centre for Environmental Research GmbH, UFZ, Leipzig, Permoserstraße 15, 04318 Leipzig, Germany

[2] Institute of Economics, Faculty of Economic and Administrative Sciences, Universidad Austral de Chile, Isla Teja, Valdivia, Chile

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viewer" (Max-Neef et al. 1990:18). They devised the HSDA as a development approach whose purpose is not to increase productivity but to increase collective and individual well-being through the satisfaction of what they call Fundamental Human Needs, henceforth FHN (Guillen-Royo 2020). HSDA has been applied by various scholars in the context of environmental sustainability over the past ten years or so (Spiering and Barrera 2020). In our practical experience (ibid), HSDA provides a set of practical methodological guidelines for co-producing three types of knowledge needed to achieve sustainability transformations: (1) systems-knowledge (about what is), (2) target-knowledge (about what should be) and (3) transformation-knowledge (about how to get from where we are to where we should be) (Lys 1997; Kueffer et al. 2019). While the original methodological proposal of Max-Neef et al. (1990) mainly emphasizes the current and future states of a system (and thus provides systems- and target-knowledge), in previous work we have presented two adaptations of HSDA that focus additionally on providing transformation-knowledge (Spiering and Barrera 2020). In this paper, we present the HSDA theory of FHN along with our adapted methodological frameworks as valid methods for Transformative Science (TSc).

TSc was launched as a new paradigm nearly a decade ago to contribute to sustainability research with a normative orientation (Schneidewind and Singer-Brodowski 2013). It acknowledged that scientific outputs remain limited in addressing fundamental sustainability challenges. By contrast, TSc seeks not only to describe and analyse transformations but to further co-create and assess possible solutions and to carry out an educational mandate (Beecroft 2018; Bergmann et al. 2021). The World Social Science Report calls for transformative science "that facilitate[s] collaborative learning and problem solving, around concrete challenges and in specific social-ecological contexts" (ISSC/UNESCO 2013:9). Jaeger et al. (2011) emphasize that TSc is urgently needed to contribute to a democratisation of knowledge in an increasingly complex setting characterised by multiple compound problems.

Scholars generally agree that there are multiple methods for producing participatory knowledge, and many suggest that sustainability problems can best be solved by mixing and (re-)combining these methods (Wiek and Lang 2016; Wittmayer et al. 2018). To strengthen TSc research, the potential of these methods needs to be clarified and they need to be further developed and evaluated in relation to quality criteria (WGBU 2011; Belcher et al. 2016; Schneidewind and Rehm 2019).

To our knowledge HSDA has not yet been discussed as a method for TSc. While many methods for TSc exist (Wiek 2016), we are not aware of one that places reflection about human needs centre stage in the way HSDA does; we are convinced that such reflection substantially enhances the co-production of potential, evidence-based solutions and we therefore propose HSDA as a valuable method for inclusion in the TSc toolbox, complementary to existing methods.

The main question we explore in this article is the extent to which HSDA can serve as a method for TSc. This implies two further questions: is HSDA applicable at all in the context of TSc and, if so, what added value can it deliver to the existing canon of TSc methods? We seek to explore how HSDA can contribute to a mode of development based on reflection about the satisfaction of human needs and what implications this has for using it as TSc.

To address these issues, we examine (1) how HSDA is generally applicable in TSc and (2) how our adaptations meet TSc quality criteria. We do this by testing HSDA against TS quality criteria that we have compiled in an analytical framework to reflect on the research process and on scientific, societal and educational impacts. Our aim is to underpin the claim that HSDA fulfils the TSc quality criteria and can be used to address complex sustainability challenges. We outline the key elements of the approach and its implications for TSc, showing how HSDA delivers added value additional to other TSc methods. In doing so, we focus on the conceptual level and draw on our previous empirical research to illustrate, justify and exemplify our conceptual argument.

In "Background", we introduce the HSDA perspective both conceptually and methodologically, providing descriptions of our two methodological adaptations. We then define TSc and present an analytical framework to assess the quality of TSc methods derived from the literature. In "Analysis", we analyse the extent to which HSDA meets the quality criteria before outlining the added value of HSDA over and above other TSc methods. We close by presenting some limitations of HSDA for TSc and highlighting questions for further research.

Background

In this section, we provide a conceptual and methodological introduction to the HSDA before introducing the concept and quality criteria of TSc.

Introduction to HSDA

Conceptual background

In the 1980s, Max-Neef et al. (1986) devised the 'Human Scale Development' approach (HSDA) to provide an

alternative model of development for Latin American communities to neo-classical models based on satisfying material needs (Pieterse 1998). While many human development theories have established indicator measurements (such as the human development index), HSDA provides both a taxonomy of human needs (theory) and a participatory process (methodology) through which communities are empowered to identify instances of deprivation as well as potential, according to how these needs are satisfied. HSDA is a people-centred development approach whose ultimate goal is to increase human well-being through the potential of individual stakeholders to meet their needs with appropriate strategies.

HSDA theory stands on three pillars: the satisfaction of FHN, the existence of organic interactions (e.g., between human beings), and the capacity for increasing levels of self-reliance. On this basis, both social groups and individuals are recognised as creators of their own future. HSDA fosters the active participation of people and thus promotes bottom-up decisions while empowering civil society. Max-Neef et al. (1991) developed a taxonomy of FHN based on their experiences in many small-scale workshops in Latin America and Europe. They identified nine axiological (values based) needs: subsistence, protection, affection, understanding, participation, idleness, creation, identity and freedom. These are realised through satisfiers, which exist in four existential categories: being (personal or collective attributes), having (institutions, norms), doing (personal or collective activities), and interacting (locations and milieus). Whereas FHN are considered to be universal, abstract and non-hierarchical, satisfiers differ from case to case and are dependent on culture, situation, education, institutions and other factors. Thus, every society, community or group adopts different styles and generates different types of satisfiers to meet the same FHN.

On this basis, Max-Neef et al. (1986) proposed a matrix of needs and satisfiers in which the columns contain needs according to the four existential categories, the rows list the FHN according to the nine axiological categories, and the resulting 36 cells contain the satisfiers. “The matrix of needs and satisfiers may serve, at a preliminary stage, as a participative exercise of self-diagnosis for groups located within a local space”. Through a process of regular dialogue—preferably with the presence of a facilitator acting as a catalysing element—the group may gradually begin to characterize itself by filling in the corresponding squares" (Max-Neef et al. 1991:37). While the FHN have a universal and normative character, the satisfiers are experienced in an individual and subjective way, though they are shared, constructed and changed socially, culturally and collectively. Such a matrix of needs and satisfiers can be used (and developed further) to take stock of existing goods and services and to highlight how they (or the social or natural systems providing these goods and services) contribute to or inhibit the fulfilment of needs. While some goods and services can be seen in some situations as strategies to meet one specific need (singular satisfier), they can simultaneously meet (synergic satisfier), fail to meet or even impede (inhibiting satisfier) several other needs at the same time. As a result, the satisfiers are the indicators of endogenous development, as they are felt and explicitly defined by each culture, time and place and are not imposed on actors as external elements. Focusing on needs and linking satisfiers to needs “allow[s] for the discovery of unexpected facets of a problem, thus increasing awareness about what [is] relevant” (Max-Neef et al. 1991:43). Although the original proposal provides a “matrix type’ as an example, the proposed methodology is based on the collective filling in of an empty matrix. The completed matrix is not normative but rather a heuristic device developed by a particular group or community at a given time. While the matrix is a methodological tool and not an end in itself, part of its potential is that it generates a reflective and critical attitude for diagnosis, planning and evaluation.

The matrix has since been used by academics and practitioners as both a theoretical framework in desk studies and a participatory tool with groups of people or communities (Spiering and Barrera 2020).

HSDA links needs with sustainability

Within the last decade, scholars have introduced the HSDA framework in the context of environmental sustainability and shown its potential to contributing toward sustainable development (Cruz et al. 2009; Jolibert et al. 2011; Guillen-Royo 2016, 2020; García Ochoa and Graizbord 2016; Lamb and Steinberger 2017; Vita et al. 2019; Kaltenborn et al. 2020).

The basic idea of the HSDA theory is that development is about people and not objects. Development and well-being are based on the “fulfilment” of FHN and not on “satisfaction” brought about by material consumption. Accordingly—and this is the key part of our argument—reflection on the nature of FHN is central to HSDA. To our knowledge, none of the other TSc methods highlights needs fulfilment in the way HSDA does. The current understanding of “needs” based on the Brundtland Report (WCED 1987) focuses almost exclusively on material aspects and thereby legitimates economic growth in a mono-dimensional way. As a response to this utility-based perspective,

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various scholars have developed approaches that accommodate a wider understanding of "human needs" (Sen 1984; Doyal and Gough 1984; Wiggins 1987). HSDA is one of these. Linking HSDA to sustainable development requires conceptual framings that enable those involved in normatively inspired processes to evaluate, design and implement sustainability transitions on the ground. HSDA focuses on human flourishing and provides a theory of human needs for development that goes beyond economic rationality, rather comprehending the human being as a whole (Cruz 2006). It distinguishes needs from satisfiers, meaning that needs are not seen in material terms alone but also in terms of basic psychological human needs. It thus functions as a tool that helps generate answers to the question: "what do I/we really need to live a good life?". In this context Rauschmayer et al. (2012) and Guillen-Royo (2016) establish a link between needs and sustainability. HSDA enables a change in perspective on sustainable development by adding the categories of "being", "doing" and "interacting" to merely "having". It addresses not just material issues but brings in questions of what people are like, what they do and how they interact to fulfil their needs. A further contribution to sustainable development arises with the distinction between needs and satisfiers—needs are neither sustainable nor unsustainable, but satisfiers can be (for example, the need for freedom can be satisfied either by flying abroad or taking a walk in the countryside). HSDA provides the concept of synergic (bridging) satisfiers, which can be interpreted as "sustainable" strategies because they do no harm but support the fulfilment of several needs at once.

Jolibert et al. (2011) showed how the HSDA, as an anthropocentric human needs-based approach, can be widened to become a more global and ecosystemic one by reflecting the needs of non-humans (in this case otters) in an environmental fisheries conflict.

HSDA gathers people's knowledge about the system in question and enables a synergic creation of shared knowledge about its actual and potential contributions to human (and non-human) well-being. "Needs are satisfied within three contexts: with regard to oneself (Eigenwelt); with regard to the social group (Mitwelt); and with regard to the environment (Umwelt)" Max-Neef et al. (1990:21). We add that by adopting a longer-term perspective on needs and sustainability, a fourth context can be added—posterity (Nachwelt) (see Fig. 1). To conclude our argument, then, HSDA informs TSc by helping those involved to move from the individual level of needs satisfaction to a collective dimension. By reflecting on the satisfaction of both human and non-human needs, it takes account of the individual (micro-level), the social group (meso level), the environment (macro level) and future generations (future level).

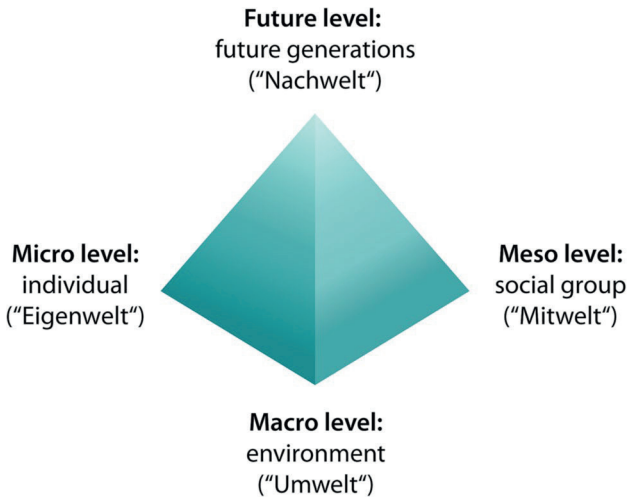

Fig. 1 HSDA contributes to sustainable development by facilitating the synergic actualisation of needs on four levels

To our knowledge, HSDA has not yet been linked to the general scheme of TSc, either in general terms (e.g., contributing to the three knowledge types) or in more concrete terms (e.g., how it meets TSc quality criteria).

Adapted HSDA methodology

Applications of HSDA methodology The original workshop methodology has been adapted and further developed in several ways and different fields, thus enhancing the original approach (Picón et al. 2006; Bucciarelli and Alessi 2013; Guillen-Royo 2020).

In a previous article, we presented two possible adaptations of the original methodological HSDA proposal and provided detailed guidelines for the facilitation of HSDA workshops (Spiering and Barrera 2020). Here we refer to this work to illustrate how these adaptations of the original HSDA proposal contribute toward generating TSc knowledge. The version developed by Barrera (Ibid 2020) is an adaptation of the original methodology generated in the learning environment of the HSDA Master's programme at the University Austral of Chile (UACh) in close collaboration with Manfred Max-Neef. The version proposed by Spiering (2020) builds mainly on Guillen-Royo's (2016) workshop proposal. Our particular contribution is to adapt the original HSDA and apply the new frameworks in various case studies. Between 2014 and 2019, the authors conducted a total of 18 workshops

(10 conducted by Barrera in Chile and 8 by Spiering in Germany and Chile), each time following the procedures outlined below. For the purposes of this paper, we refer to two case studies, illustrated in "BOX 1" and "BOX 2" below. Rather than providing detailed case descriptions, we describe them only briefly as a means of underpinning our argument.

BOX 1: Case study of the Centre for Entrepreneurial Learning with vulnerable teenagers (Barrera 2017)

The Centre for Entrepreneurial Learning (CEM) at UACh in Chile run a case study that was part of the "Youth Economic Participation Initiative" project (YEPI) (Tisch 2017). CEM supports innovative ways of educating and preparing young students for employment and entrepreneurship. Its programme is based on the belief that students can be powerful agents for change in their own communities (Hoyt et al. 2016). CEM seeks to encourage locally rooted leadership development and community-driven entrepreneurial projects as it "is not a typical university centre. […] Its commitment to Human Scale Development functions as a model for community development, while strengthening place-based culture and history" (Hoyt et al. 2016: 6). Within the YEPI project CEM convened four HSDA workshops between 2014 and 2016 with young people from different Chilean communities and backgrounds who came together to reflect on the potentials as well as the deprivations young people are facing in their communities, linking the local with the regional scale. In all, between 10 and 20 young people attended the workshops, which were facilitated by up to seven HSDA Master's students with the support of one of the authors (Centro de Emprendizaje UACh 2015; Barrera 2017)

BOX 2: Case study with German Energy Cooperatives (Centgraf 2018)

The second case study was part of the German EnGeno research project (Lautermann et al. 2017) in which members of German Renewable Energy Cooperatives (henceforth RECs) reflected on the challenges and potential of their own involvement, starting with their individual needs. The main research question was: how can the members of RECs be supported in their largely voluntary activities? The study's rationale was therefore that a needs-based perspective might contribute towards developing new strategies to help the members of RECs individually to meet the challenges arising from their civic engagement. In three HSDA workshops, board members as well as active and passive members reflected on the challenges they experienced due to the rapid development of their REC as well as on the potential benefits of their engagement. The goal of the study was to support the REC members, most of whom are involved on an unpaid basis, in order to help initiatives to remain robust over the long term. Facilitating the development of new strategies helped the members of RECs individually to better meet the challenges arising from their civic engagement (Centgraf 2018)

Brief overview of HSDA adaptations in relation to the original methodological proposal Here we offer a brief description of our two adaptations of the original proposal without comparing their differences and commonalities in further detail, as this is done in Spiering and Barrera (2020).

Fig. 2 The original methodological proposal and two slightly differing HSDA adaptations

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The methodological frameworks of our HSDA adaptations are structured according to Wittmayer and Hölscher's (2016) proposal of six main phases within participatory research processes (Fig. 2). This structure was applied retrospectively to the original framework and the adaptations to facilitate an overview of differences and commonalities. Participatory research processes are divided into six main phases: (0) joint understanding of problem and terminology, (1) problem analysis, (2) vision building, (3) strategy development, (4) monitoring and evaluation and (5) reflection of the whole process. There are multiple examples of approaches that focus on phase one. "The latter parts (steps 2–5) often receive less attention and there are not enough methods to scientifically follow these steps and feed the outcomes back into the research process" (Wittmayer and Hölscher 2016:21). In both adaptations, we provide options for strengthening HSDA in this regard and demonstrate how the adaptations meet TSc quality criteria. Whereas the original proposal of Max-Neef et al. (1991) places emphasis on phases (1) and (2) we additionally focused on different ways of generating transformation-knowledge (phase 0) and phases (3)–(5)).

The original proposal by Max-Neef et al. (1991) does not include a preparation phase. Within our adaptations we included a phase 0, as we consider it important to collect information regarding participants' expectations about the aims of the workshop and to formulate a shared definition of the problem.

Each of the three proposals uses its own concepts for filling in the matrix in a participatory manner to find all the factors that impede the actualisation of participants' needs (phase 1) and the factors that support the group's development in the best way possible (phase 2). Max-Neef et al. (1991) emphasize the negative and the utopian matrix (indicated in the figure by the yellow star). Barrera's adaptation seeks to combine the problem analysis with the visioning phase in a single system analysis where negative and positive factors are collected at the same time. This process results in a negative and a positive matrix. Regarding strategy development (phase 3), in the original proposal, participants talk about bridging the negative and the utopian matrices to identify synergic satisfiers and how these can be implemented. However, this process is not presented in any further detail and nor is there any indication of what follows next. Barrera conducts a phase 3 where the previously identified satisfiers are then prioritised and validated or, on the contrary, revised or clarified; further the conversation is directed toward reflecting on the satisfiers as being endogenous, exogenous or synergic. This results in a synthesised matrix that forms the core of her approach. In Spiering's adaptation, participants identify the key issues of the negative and utopian matrices to determine a number of synergic bridging satisfiers and build a new matrix using these bridging strategies. In contrast to Guillen-Royo's (2010) model, the group undertakes a SMART analysis (**s**pecific, **m**easurable, **a**chievable, **r**elevant and **t**ime bound) and decides what kind of strategy can be implemented, by whom and by when. This results in a clearly defined timetable and work plan as one main outcome, in addition to an overview of all impeding factors, all utopian factors and the bridging satisfiers as strategies for further development.

Both Barrera and Spiering propose a phase 4 and phase 5, unlike the original version which mentions neither monitoring and evaluation nor a reflection of the process as a whole:

Phase 4 In Barrera's proposal, the workshop results are identified as potential pathways and guiding principles that participants possess and through which they aspire to satisfy their FHN. Finally, the data are interpreted by the researchers who are also part of the knowledge generation process. In Spiering's adaptation, the workshops end with a face-to-face evaluation session and a written evaluation. As a follow-up, the participants are offered an extended workshop report that includes a compilation of all the results.

Phase 5 Barrera reflects on the whole process in a project report. In the special case of the HSDA Master´s programme, these reports are presented by the researchers and students of the programme, as part of their learning and training as change agents. Spiering's adaptation includes a post-workshop survey where information about the implementation of the work plan and comments concerning the methodology are gathered. For our own reflection on the whole process, we researchers evaluate the research diaries we have all kept from the beginning of the process.

With regard to our analysis of the appropriateness of HSDA as a method for TSc, these two adaptations are significant because they place an emphasis on phases (3)–(5) which are relevant to producing systems-, target- and transformation-knowledge. Our aim here is not to elevate our adaptations above other possible applications. Instead, we seek to present them as a supplement to TSc, highlighting those that we perceived as helpful and whose quality we were able to test using appropriate criteria.

About TSc and how to assess its quality

Transformative science

In the following, we introduce TSc as an approach that exists beneath the wider umbrella of transformation research and is more encompassing than transformative research. In 2011, the German Advisory Council on Global Change (WGBU) launched transformation research as a reflexive and systemic approach whose main subject is "the global transformation towards a low-carbon society" within a democratic exploratory process (WGBU 2011: 332). Transformation research is described as an "emerging and common

research perspective" (instead of a research field) that has widely been replicated and can "serve as catchment basin and integrator of diverse angles on societal change towards sustainability" (Wittmayer et al. 2018:6).

The WGBU differentiates between transformation research and transformative research. Transformation research is concerned with understanding and analysing transformation processes and is widely defined in terms of descriptive-analytical/knowledge first approaches that work with a "description and analysis of past, current, and future states" (Wiek et al. 2012:7). It thus focuses on generating conceptual knowledge. With the experimental turn in sustainability-related social sciences these "linear and technocratic solution approaches" (Bergmann et al. 2021) were recognised as being insufficient to address complex sustainability challenges (Overdest et al. 2010). Since then, scholars have increasingly pursued action- and practice-oriented research to produce "actionable knowledge" (Wiek et al. 2012; Caniglia et al. 2020). This is described as "evidence-supported guidance for practical application that has been tested in successful efforts to solving (or at least mitigating) a sustainability problem within the defined experimental setting" (Schäpke et al. 2016:47). It is sought to co-create robust context-specific solutions that are valid both inside and outside academia and actions necessary to address pressing social and environmental problems (Patterson 2015; Hölscher et al. 2021).

Transformative research is widely defined in terms of such process- and action-oriented approaches (Miller et al. 2014; Wittmayer and Schäpke 2014; Wiek and Lang 2016). Its goal is to "address problems of unsustainability challenges by inventing and assessing possible solutions and by creating related actionable knowledge, including strategies that can solve (or mitigate) certain problems" (Bergmann et al. 2021). Thus, transformative research complements descriptive-analytical approaches while also developing "evidence supported solution options" (Wiek and Lang 2016:32). However, being fairly new, transformative approaches are still far less represented within transformation research (Wiek et al. 2012; Feola 2015; Wittmayer et al. 2018).

Taking the differentiation between transformation and transformative research as their point of reference, Schneidewind and Singer-Brodowski (2013) proposed TSc as new paradigm that goes beyond transformative research and additionally encompasses transformative education and a focus on institutional change in the science system (Schneidewind and Singer-Brodowski 2016). TSc pursues a threefold aim: to generate new knowledge (scientific research objectives), to initiate and accompany transformation processes (practical objectives), and to stimulate and support learning processes (educational objectives) (Beecroft et al. 2018; Vogt and Weber 2020). These objectives form the basis of the analytical framework we present in "Analytical framework for assessing the quality of a TSc method" as a means to assess the quality of TSc methods. We put forward our argument within the TSc framework because we conduct transformative research in an environment of transformative education (with Master's students and other sustainability science scholars). We argue that transformative research cannot be conducted without reflecting on institutional circumstances and the specific constraints of this kind of research within the scientific system; our hope is to induce changes by drawing attention to these.

TSc has been criticised for being too solution-oriented (solutionism) (Stock 2014; Strohschneider 2014; Grunwald 2018) and for potentially creating a de-politicised expertocracy (Meisch 2019). This debate has stimulated a process of clarification regarding the relation between science and society, the role of research in democracies, and funding conditions (Singer-Brodowski and Schneidewind 2019). Jaeger-Erben et al. (2018) warn that the intra-scientific debate on TSc is progressing so rapidly that the empirical knowledge base cannot keep pace. As TSc is in the developmental stage, they argue, it needs more rigorous systematisation and empirical TSc research practice that is methodologically and theoretically well grounded (ibid). With our analysis of HSDA as a method for TSc, we seek to contribute to sound methodological reflection on TSc methods, outlining its potentials and drawbacks for generating actionable knowledge.

Analytical framework for assessing the quality of a TSc method

Further empirical research designed on the basis of actionable knowledge is necessary because TSc lacks established, systematised approaches and sound empirical research practice (Wittmayer et al. 2018). On one hand, then, it may be that new, re-defined, or even re-discovered methods for TSc are needed; on the other, perhaps "the potential of existing methods [also] needs to be clarified" (ibid:18). Several methods have been developed for TSc and applied over the last few years (Wiek and Lang 2016; Wittmayer et al. 2018; Borner and Kraft 2018; Bergmann et al. 2021). In the German TSc debate, real-world laboratory research (Reallabore) has gained prominence (Wagner et al. 2016; Defila and DiGiulio 2019) as an "ideal-type […] of transformative research" (Schneidewind et al. 2016:10). What these methods have in common is that they build on participatory frameworks and are mainly of a qualitative character (Bergmann et al. 2021). Different facilitation techniques including creative, arts-based and visual methods, especially ones that promote dialogue, are increasingly being deployed within TSc (Defila and DiGiulio 2018; Caniglia 2020). They contain components such as participatory visioning, pathways

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and backcasting (Quist et al. 2011). Still few quality criteria have thus far been described and defined specifically for TSc, even though scholars insist it is crucial to develop TSc methods and quality criteria to (1) contribute to the recognition of co-produced knowledge among "traditional" scholars, (2) pave the way for a debate about how these might contribute to transparency and credibility in co-produced knowledge, and (3) support the research practice that would benefit from a TSc methods canon of proven quality (Wiek and Lang 2016; Stelzer et al. 2018; Defila and DiGiulio 2018). Existing disciplinary quality criteria and quality control indicators based on the present scientific paradigm (excellence, peer review and citation indexes, among others) are not sufficient for the evaluation of TSc, as they neglect the societal relevance and educational impact of TSc research (Wittmayer et al. 2018).

While quality criteria in relation to transdisciplinary research methods have been discussed in the scientific literature for many years in general (Bergmann et al. 2005; Jahn and Keil 2015; Zscheischler et al. 2018) only few proposals are currently being debated with regard to a methodological quality assurance of TSc (Defila and DiGiulio 2018; Wiek 2016; Hölscher et al. 2021; Bergmann et al. 2021). As TSc is defined by characteristics like co-design, practical relevance, democratic knowledge production, normativity and catalysing role, quality criteria for TSc need to be based on these characteristics (Jaeger-Erben et al. 2018). For our exploration of the suitability of HSDA as a TSc method, we have developed an analytical framework in which we combine certain TSc characteristics (Parodi et al. 2018, 2019), essentials for second-order research (Fazey et al. 2018) and criteria (Wittmayer et al. 2018) to show how they contribute toward addressing the three objectives of TSc (Fig. 3).

Normativity The overarching goal of TSc is to catalyse change for sustainability transformations, which requires an explicit normative positioning (Fazey et al. 2018). Several scholars highlight the need for suitable facilitation approaches that enable normative issues to be addressed when devising instruments for sustainable transformations (Fazey et al. 2018; Wamsler et al. 2020; Hölscher et al. 2021). Schäpke (2018) stresses the need to address the "normativity gap" within transition studies while Parodi et al. (2019) caution that it is important to stick to the characteristics of real-world labs, such as normativity and an orientation toward the principles of sustainable development,

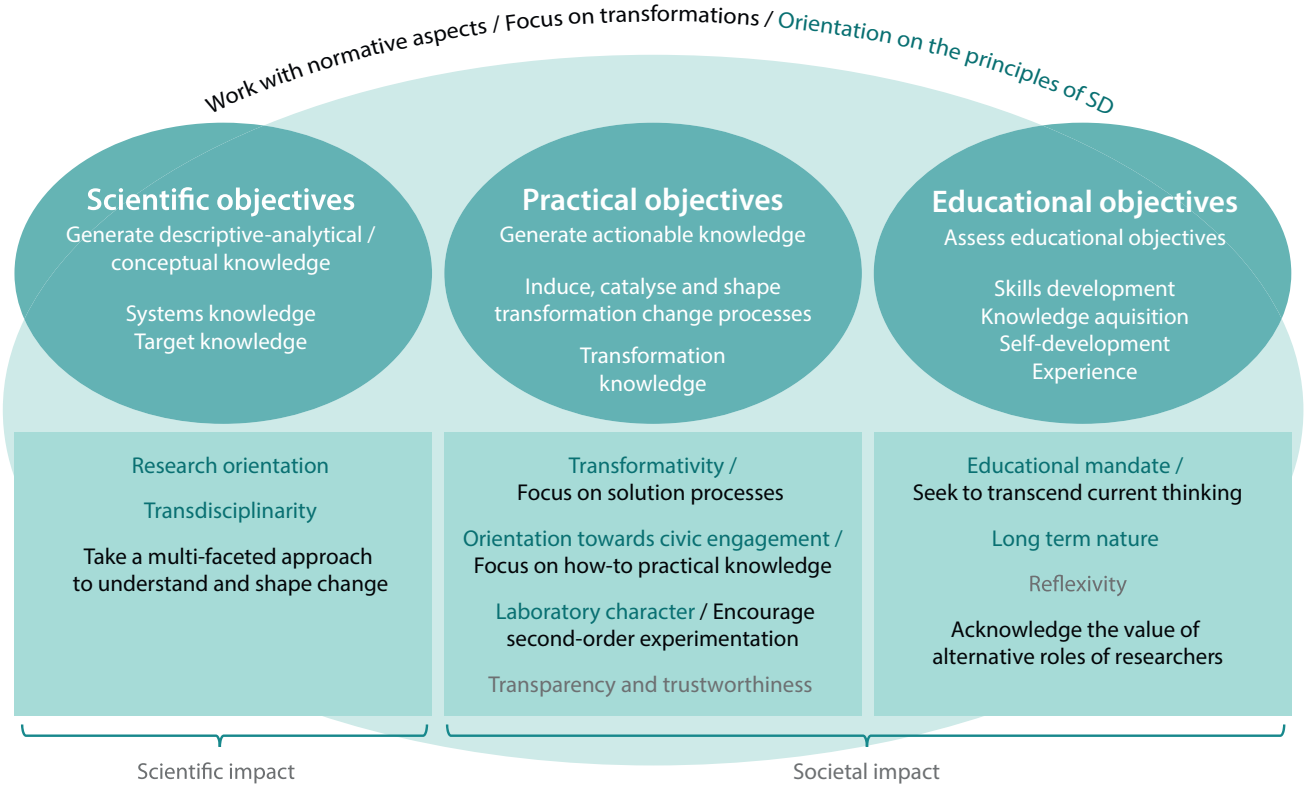

Fig. 3 Analytical framework—assessing TSc methods that ideally display certain characteristics and thus contribute toward addressing three main objectives

in order not to dilute the concept. Thus, it is vital that TSc methods contribute toward revealing underlying unsustainable practices and challenging unsustainable "structures, systems, mindsets and cultures" (Fazey et al. 2018:57).

Further, the central challenge of TSc lies in in its aim of combining scientific knowledge production about transformations with that of catalysing practical changes and facilitating learning processes (Beecroft 2018).

Scientific objectives The scientific objectives of TSc are to create a scientific impact by generating, integrating, assessing and disseminating conceptual knowledge relevant to transformations (Wittmayer et al. 2018; Parodi et al. 2018, 2019). Considering the three types of knowledge mentioned above (cf. "Introduction: The Human Scale Development approach as a methodology for transformative science?"), TSc methods should generate systems-knowledge (to understand an issue, its dynamics and causal influences) and target-knowledge (about the desired future state of the system and why this state is desired) (Lys 1997; Parodi et al. 2018, 2019; Beecroft et al. 2018). In contrast to Beecroft et al. (2018), we assign transformation-knowledge to "practical objectives", as this kind of knowledge not only describes options for change, but also contains potential for action (actionable knowledge). Gaining descriptive-analytical systems- and target-knowledge implies interdisciplinary as well as transdisciplinary approaches, as methods should contribute toward a multi-faceted approach to understanding and shaping change (Fazey et al. 2018).

Practical objectives The practical objective of TSc is to achieve a social impact by co-producing actionable and transformation-knowledge (the third of the three types of knowledge) about the ways and means available of realising the desired state of a system in practice (Gaziulusoy and Boyle 2013; Wittmayer et al. 2018). Wittmayer et al. (2018) state that research should be judged according to its social impact. TSc methods should thus focus on solution-oriented processes suitable for "shaping the societal changes needed and for implementing solutions" (Fazey et al. 2018:57). Further, they should address critical questions about solutions and their implementation and thus generate "how to" practical knowledge that informs research. This requires practical engagement with civil society while acknowledging that practical knowledge is embodied and context specific (ibid). TSc methods should provide structured procedures and open spaces for experimentation, as creating change requires iterative learnings, thus the "laboratory character" of these processes should be acknowledged (ibid, Parodi et al. 2018, 2019).

Educational objectives The third dimension of TSc seeks to achieve educational objectives. Beecroft (2018) suggests that educational objectives should be assessed explicitly in the planning, support and evaluation of projects and their respective methods. Researchers should consider, he argues, whether the participants (scientific scholars, students as well as practical and other stakeholders) in the TSc process are pursuing educational objectives for themselves or whether they are also seeking to educate others. Thus, methods should be evaluated in terms of the kind of educational objectives they help to achieve; above all, the educational mandate of TSc should be acknowledged (Parodi et al. 2018, 2019). Beecroft (2018) differentiates between skills development, knowledge acquisition, self-development and experience. To support these different kinds of learning, TSc processes should ideally be of a long-term nature (Parodi et al. 2018, 2019) and seek to transcend current thinking, as "many contemporary problems cannot be addressed by the same kinds of thinking that created them" (Fazey et al. 2018: 57). As part of this, reflexivity is seen as a crucial element of TSc that is frequently omitted (Finlay 2002; Pereira et al. 2020). Yet it is vital to reflect on the relation between researchers and practitioners, the researchers´ influence on the processes and outcomes as well as on their underlying (normative) assumptions (Wittmayer et al. 2018; Fazey et al. 2018). Even more important here is that researchers reflect on and value their different roles in TSc research processes (ibid, Wittmayer and Schäpke 2016). This includes introspection and a consideration of the researcher's own background and normative orientation (Wittmayer et al. 2018).

With the analytical framework presented here, we seek to show how HSDA embodies TSc characteristics and contributes to its three main objectives. To show how HSDA contributes toward co-producing the three types of knowledge for TSc, we will use the Transition Cycle (Fig. 4) presented by the German Wuppertal Institute based on Loorbach's (2010) Transition Management Cycle as "a concept that enables transformation research to be linked to transformative research, that focuses on the principles of transdisciplinarity, and that aims to generate socially robust knowledge. As a concept ideal for practical research and a blueprint for research designs, the Transition-Cycle aims to take into account all three forms of knowledge" (Bierwirth et al. 2017:30). Given that the adapted HSDA is an appropriate tool, it is vital to ensure the scientific quality of the research to protect the credibility of TSc for sustainable development.

Analysis

In this section, we analyse the extent to which HSDA meets the quality criteria for TSc methods presented above. To do so, we draw on early HSDA studies and also refer to our own published work (Barrera 2017; Centgraf 2018; Olivares-Aising and Barrera 2019; Spiering and Barrera 2020).

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Fig. 4 Transition-Cycle, source: German Wuppertal Institute (Bierwirth et al. 2017:31) (based on Loorbach 2010:173)

Normativity: how HSDA re-orients sustainable development

Offering and conducting HSDA processes is about contributing to change in a certain community/group/system: it explicitly allows normative assumptions—as long as these are made transparent. HSDA was originally introduced to re-conceptualise the economic development process in terms of human well-being from a systemic perspective, and this entails a powerful normative component (Cruz et al. 2009). When the focus is on sustainability transformations, HSDA processes offer explicit normative orientations by conceptually linking needs with sustainability (cf. "HSDA links needs with sustainability"). Guillen-Royo (2020) promotes HSDA as a needs-based approach to consumption that is fundamentally normative "as consumption practices and behaviors are evaluated in terms of their contribution to human needs" (ibid: 118). Jolibert et al. (2014) address sustainable planning as a normative goal. They propose a definition of "sustainable satisfiers" to negotiate sustainable regulations and politics based on needs actualisation. In the RECs example, the normative objective was to support RECs as niche players within the German energy transition to strengthen their development (Centgraf 2018). The Chilean team operated under the normative framework of CEM (Hoyt 2016). Several scholars point out that it is essential for scientists to initiate deliberative learning processes with different societal actors to negotiate what sustainability means for specific situations (Schäpke 2018, Schneider et al. 2019). The HSDA concept of synergic needs actualisation provides a normative yardstick and allows to reflect on both existing sustainable development visions and on the creation of new ones that are context dependent. However, whether or not a process has been transformative can only be assessed ex-post. Thus, as method for TSc, HSDA can help to orientate research toward transformative change, but it should be cautious about claiming to generate normative results.

Scientific impact

Research orientation

Scholars are increasingly applying and assessing the HSDA within research projects to gain conceptual knowledge about sustainability transformations and to publish their results in books or peer-reviewed journals (Gonzales 2010; Guillen-Royo 2016; Lamb and Steinberger 2017; Brand-Correa et al. 2018; Vita et al. 2019). In the RECs case, for instance, the results were fed into a scientific debate on energy cooperatives as niche players and change agents for sustainability transformations (Huybrechts and Mertens 2014; Brummer 2018; Centgraf 2018). With her HSDA research, Guillen-Royo contributes conceptual knowledge to the scientific discourse on sustainable consumption (Guillen-Royo 2020). These projects thus generate and reintegrate conceptual knowledge and reliable insights that can be taken up within science (Defila and DiGiulio 2019). In this way, they contribute "to the further development of scientific knowledge" (Altrichter and Feindt 2008:461).

Taking a multi-faceted and transdisciplinary approach to understanding and shaping change

Collaboration and co-production with diverse stakeholders in transdisciplinary settings is a core element of the HSDA, as groups are crucial to meeting individual needs and generating well-being, and vice versa. In the RECs case, the research team included people with a background in ecological economics, environmental psychology and geography, respectively, and they collaborated with REC board members, members and political stakeholders. Thus, multiple perspectives were included in the co-production of knowledge. The co-creation of synergic bridging satisfiers within HSDA processes includes multiple perspectives on development and furthers negotiation processes on how the fulfilment of needs shapes actions and decisions. HSDA functions as a pluralistic approach that recognizes diversity and offers options to negotiate multiple lenses and ways of understanding the world (Fazey et al. 2018).

Generating systems- and target-knowledge

HSDA provides useful entry points with recursive learning loops for the development of descriptive-analytical system- and target-knowledge (cf. Fig. 4). The original methodological proposal mainly identifies the deprivation present in a given society and thereby contributes to an understanding of the factors that impede development (systems-knowledge). This analysis gives rise to a sense of encouragement and constitutes a starting point for developing further strategies for transitions. The adapted workshop format devised by Barrera (2017) also serves analytical purposes and thereby helps generate systems-knowledge, but it goes further as well: by building a synthesising matrix and discussing bridging and synergic satisfiers, the process uncovers the potential that communities and groups have at their disposal (target-knowledge, phase 3, Fig. 2). HSDA processes as proposed by Spiering (2020) inform TSc research by providing system-knowledge using the negative matrix, in which all impeding factors are collected, and target knowledge through envisioning and collecting all those factors that enable optimal fulfilment of FHN. These system analyses and participatory visioning elements are complementary to other TSc methods like transition management (Wittmayer et al. 2018:16). Such an analysis supports an understanding of the system at hand and helps participants to envision a desirable future. Further transformation-knowledge can be build on this.

Practical impact—societal impact

Transformativity/create actionable and transformation-knowledge/ focus on solution processes

HSDA processes open up transformative spaces in which relevant, context-sensitive and socially robust actionable or transformation-knowledge is engendered. Both HSDA adaptations above focus on solution-oriented processes and finish with action plans based on a reflexive dialogue about possible future orientations. In the RECs and the CEM case, a set of very concrete outcomes were generated along with applicable, context-specific knowledge and options. Barrera's adaptation lays the groundwork for sustainable development strategies by discussing bridges between the synthesised matrices and reflecting on the satisfiers as endogenous, exogenous or synergic (transformation-knowledge). In Spiering's adaptation, transformation-knowledge is generated through the elaboration of action plans for implementing strategies and mutual learning. Thus, conditions for change unfold, while the salience and accessibility of outcomes depends on the participants and on how they implement the strategies jointly developed during the process (Caniglia 2020).

Orientation towards civic engagement/focus on practical 'how to' knowledge

The HSDA adaptations focus on practical 'how to' knowledge and critically scrutinise potential solutions by reflecting on their nature as synergic or impeding satisfiers. In both cases presented above, the civil society actors perceived their ownership of the outcomes due to their strong involvement and the status of being experts in their own field. The socially robust outcomes of HSDA processes are firmly rooted in the self-reliance of the actors and thereby "change the way in which people are enabled to perceive their own potentials and capabilities" (Max-Neef 1990:52). On the individual and collective level, participants are empowered by reflecting on strategies that fulfil their needs and the needs of the group members and community. A remaining challenge—as for transdisciplinary impacts in general (Bergmann et al. 2021)—is to identify the social impact of HSDA processes more precisely. Here we can only make approximate statements about how change has been effected at individual, collective and system levels and how these change processes might be further catalysed (Pereira et al. 2020).

Laboratory character/encourage second-order experimentation

In its different applications, HSDA explicitly opens up spaces for experimentation: in the vision building and strategy development phases, possible development options are co-produced. In a participatory action research project, Guillen-Royo (2014) accompanied workshop participants in a Peruvian case study to organise and implement an organic vegetable garden and a parents' school as they had formerly ranked these strategies as most synergic bridging satisfiers for needs actualisation. This learning by doing process illustrates how an HSDA process may support learnings for larger and more complex activities and may produce evidence about and action for solutions (Fazey et al. 2018). For this purpose, HSDA provides a well-structured, iterative learning process to enhance self-empowerment and create change. It does not suggest a particular development trajectory but focuses on process-based change towards a community that would be desirable for its citizens. Defila and DiGiulio (2018: 9) suggest the following preconditions for breaking new ground and experimenting: the actors involved must be willing and able to leave their own comfort zone, to detach themselves from their thinking and decision-making mechanisms and to think and trying out things they have not thought and tried before. The research setting, in turn must provide the actors with a framework that enables them to do things that they would otherwise not dare to try. This requires the creation of spaces for experimentation that allow

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all actors involved to try the unfamiliar. In the RECs as well as in the CEM cases, both of these preconditions were given: participants took the plunge to reflect their personal and collective needs and HSDA scholars provided what Pereira et al. (2020) call "safe-enough-spaces" within transformative learning environments. These spaces acknowledge the vulnerability of participants who might be putting themselves at risk by participating in the first place or who may be challenged by having to "unlearn and relearn" their own assumptions and points of view.

Transparency and trustworthiness

Our adaptations provide structured and replicable sequences of steps that contribute to the transparency of the processes and ensure the credibility of the research (Wiek and Lang 2016). Clarification of expectations and goals in advance is crucial to communicate clearly the purposes for which HSDA is applied. In general terms, van der Hel (2018) recommends humility regarding the capacity of science to provide solutions. Jaeger-Erben et al. (2018) argue that the transformative implications of an intervention may only be assessed retrospectively; they appeal for more restraint concerning the outcomes of transformative processes. In the cases presented here, the time frames were set very clearly, as were the goals, namely, to provide expertise on the methodology rather than solutions for future development. In the RECs case, this prompted some frustration, as some participants had expected they would receive advice from experts (the researchers) on how to further develop their REC. Thus, communication of the potential and limitations of the process is essential. Finally, transparency was established by providing access to the methodological procedures and results through workshop reports, including reports in which the process was reflected upon. To foster the trust and confidence needed to engage in open and honest dialogue, a sense of shared identity with the participants is established that validates all the participants' right to speak for and on behalf of others, as was the case in the CEM study.

Educational impact

Educational mandate/seek to transcend current thinking

HSDA processes as we propose them constitute a self-reflexive tool that, beginning with problem definition and a joint understanding of terminology, promotes a dialogic process containing numerous elements of mutual learning. It thus achieves some significant educational objectives (Spiering and Barrera 2020). In the case of CEM, educational objectives were explicitly planned, supported and evaluated before, during and after the research process. Participants as well as scholars and students developed new skills throughout the HSDA processes (e.g., participants got to know a new method of reflection, students improved their facilitation skills). All the participants acquired new knowledge: systems-, target- and transformation-knowledge. Self-development processes were triggered by the process of reflecting on individual needs. According to Horlings et al. (2020), research aimed at supporting transformation can change the researchers themselves. They point to action research, "where these types of changes are called 'process-impacts' which include changes in modes of collaboration, relationships, everyday practices and worldviews" (ibid: 471). The HSDA process provides spaces for open dialogue in which all actors experience the co-production of actionable knowledge. This is something Wamsler et al. (2020) deem essential to mindset changes to transcend current thinking. These spaces for reflection enable the contestation of prevailing views, needs and interests through individual and social learning processes. In this way, tacit knowledge that is "developed by doing, and embedded in skills, expertise and values" was made explicit (Caniglia 2020:50).

Long-term nature

The cases presented above comprised just one or two workshops and the respective pre- and post-workshop surveys. Follow-up work went further, addressing community engagement. Out of her experience with long-term participatory action research processes Guillen-Royo (2016) warns that one-off workshops may lead to disempowerment within collaborative endeavours. Following Pereira et al. (2020) transformative spaces need continued processes of engagement. In this regard, then, the case studies were not ideal regarding their potential impact, but depending on the financial and temporal resources available, HSDA processes can be extended over prolonged periods of collaboration, thus enhancing their impact. In a similar vein, Parodi et al. (2018, 2019) as well as Defila and DiGiulio (2020) emphasize that real-world laboratories in TSc are demanding and need time to initiate, establish, and evaluate, reflecting profound self-reflective learning processes. This requires not only different funding schemes for TSc research projects, but also a different kind of policy support (Muhonen et al. 2020).

Reflexivity

As a process for reflecting on needs, HSDA provides several entry points for establishing a reflexive practice. As the original HSDA proposal places no emphasis on scientific reflexivity, the research teams involved in developing the later versions deliberately established spaces for it. We reflected on how we intervened in the process, whether it be with the

participants, within the team (in the CEM case with students of higher education) or when writing research diaries.

Like other TSc methods HSDA triggers counter-hegemonic processes and interpretations of results, as also happens with the people (workshop participants) who analyse, discuss, interpret and construct the satisfiers (Hölscher et al. 2021). The degree of intervention of the researcher is reduced to that of facilitator of the process, thereby undermining the asymmetric relationship between researchers and researched and potentially inverting the logic of power of scientific knowledge. This is in line with Ejderyan et al. (2019) assertion that critical Social Science and Humanities researchers must provide methods that sharpen the critical skills of all those involved. There are limits to this, however, as the complexity of the approach requires trained facilitators: the participants are thus dependent on a certain scientific expertise.

Acknowledge the value of alternative roles of researchers

HSDA processes provided by research teams demand that researchers adopt flexible roles; this role switching brings many challenges and is regarded critically as it places considerable demands on the researchers (Jaeger-Erben et al. 2018; Scholz 2017; Defila and DiGiulio 2019). Simultaneously, as self-reflexive researchers, critically reflecting on and evaluating roles is vital when shaping research, actions and outcomes (ibid). In the RECs case and in the CEM case, the researchers affected the process on multiple levels, not only as facilitators but also by initiating the workshops, being part of the selection of workshop participants, introducing HSDA theory as a background to the reflection process, facilitating discussions and helping to compile and present the outcomes. Additionally, the authors were trained beforehand as professional facilitators and were thus able to prevent a sense of being overloaded with tasks—something Jaeger-Erben et al. (2018) point out as a limitation for researchers who are not facilitation professionals. Nonetheless, challenges still arose in terms of distinguishing between the different roles and in terms of expectations concerning these roles. Fazey et al. (2018) argue in favour of acknowledging the value of researchers' different roles and making the challenges associated with this explicit. In an HSDA case study in Australia, Cuthill (2003:475) engaged an external facilitator to "minimise any influence or direction-setting by the researcher". However, Max-Neef et al. (1991:100) stress the value of the facilitator's personal involvement, and we agree when they state "no understanding is possible if we detach ourselves from the object of our intended understanding. Detachment can only generate knowledge, not understanding." Although there is this overall claim of reflexivity in transformation research, up to now there has been scant dissemination of self-reflexive processes when educating students. In the CEM case, CEM as a university actor provided spaces for students to undertake a self-reflective process regarding their own values and motivations. Even here, though, this process of reflection was not embedded within a quality-assured, proven systematic procedure. We therefore agree that, ideally, such self-reflexive processes should be an integral part of academic education, to enhance researchers' awareness of the issues involved and their capacity for dealing with them (Schneider et al. 2019; Hölscher et al. 2021).

By scrutinising the HSDA in terms of the TSc quality criteria outlined above, we have shown that it serves as a method for TSc that contains several TSc characteristics and contributes to the three objectives of TSc.

Concluding discussion—added value of HSDA for TSc

In this final section, we discuss the advantages presented by HSDA in addition to other TSc methods, and what its drawbacks are.

Added value of HSDA for TSc

We have shown above that the HSDA contains several TSc characteristics and has the potential to add to the TSc methods canon. In doing so, we have contributed toward a conceptual and empirical-based understanding of how HSDA can inform TSc. Jaeger-Erben et al. (2018) conclude that the innovative potential of TSc lies in the principles of co-design and co-production, democratic knowledge production, its holistic nature, and reflexivity; we argue here that this holds true for HSDA as well. Additionally, we derive three major advantages of HSDA from our analysis that we have not found in other methods in this combination: (1) HSDA contributes toward achieving the three main objectives of TSc while generating all three types of knowledge; (2) HSDA provides an explicit normative compass for TSc by linking needs with sustainability; and (3) by including reflection on needs and focusing on human flourishing, it contributes to a shift in mindset and reveals where the current scientific system needs to be transformed to support research for sustainability.

HSDA is highly flexible to acquire scientific, practical and educational goals

One particularity of the HSDA, when adapted as outlined above, is its potential to generate systems-, target- and transformation-knowledge equally and thereby (potentially) achieve all three TSc objectives. It thus addresses multiple dimensions, and this large degree of flexibility enables

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researchers and practitioners alike to focus on each of the six phases on the six-phase framework according to the aim of the process (Fig. 2). HSDA processes generate descriptive-analytical knowledge that detects unsustainable practices, mindsets, institutions and personal or collective activities of a given group and thus nurtures critical thinking and may have a scientific impact (Fig. 5).

HSDA makes actionable knowledge explicit through collaborative experimentation and mutual learning; it nurtures cultures of responsibility and may have a practical impact. Finally, HSDA processes as learning environments nurture empowerment and agency and (potentially) generate educational impacts (Kueffer et al. 2019). We conclude that defining problems jointly results in robust application-oriented outcomes (negative matrix); jointly developing visions results in empowerment (utopian matrix), and co-creating development strategies results in long lasting, sustainable solutions (synergic-bridging satisfiers). Thus, the original HSDA proposal and both adaptations in particular provide a highly suitable tool for encouraging creativity, empowerment and solidarity while generating descriptive-analytical as well as actionable knowledge and learning essential for TSc. The flexibility of HSDA ensures that knowledge production, or rather understandings, arise in what Bierwirth et al. (2017:21) call "recursive learning processes". This is in line with Jaeger-Erben et al. (2018) who suggest a Grounded Theory of transformation-oriented research. Thus, recalling the criticism of "solutionism" (Strohschneider 2014), we follow Scholz's proposal and classify HSDA outcomes as socially robust options that acknowledge "the specific constraints (including democratic compromise) under which real-world decisions are made" (Scholz 2017:12).

HSDA provides an explicit normative compass for TSc

With its unique link between needs and sustainability, HSDA offers a special normative compass for TSc. HSDA provides a valuable entry point for normative TSc research as it interprets synergic bridging satisfiers as sustainable strategies (Guillen-Royo 2016). Conceptually linking HSDA (that is: reflections on FHN) with sustainability opens up new avenues for focusing on sustainable development and putting it into practice (Rauschmayer et al. 2011; Rauschmayer and Omann 2015). Reframing sustainable development in line

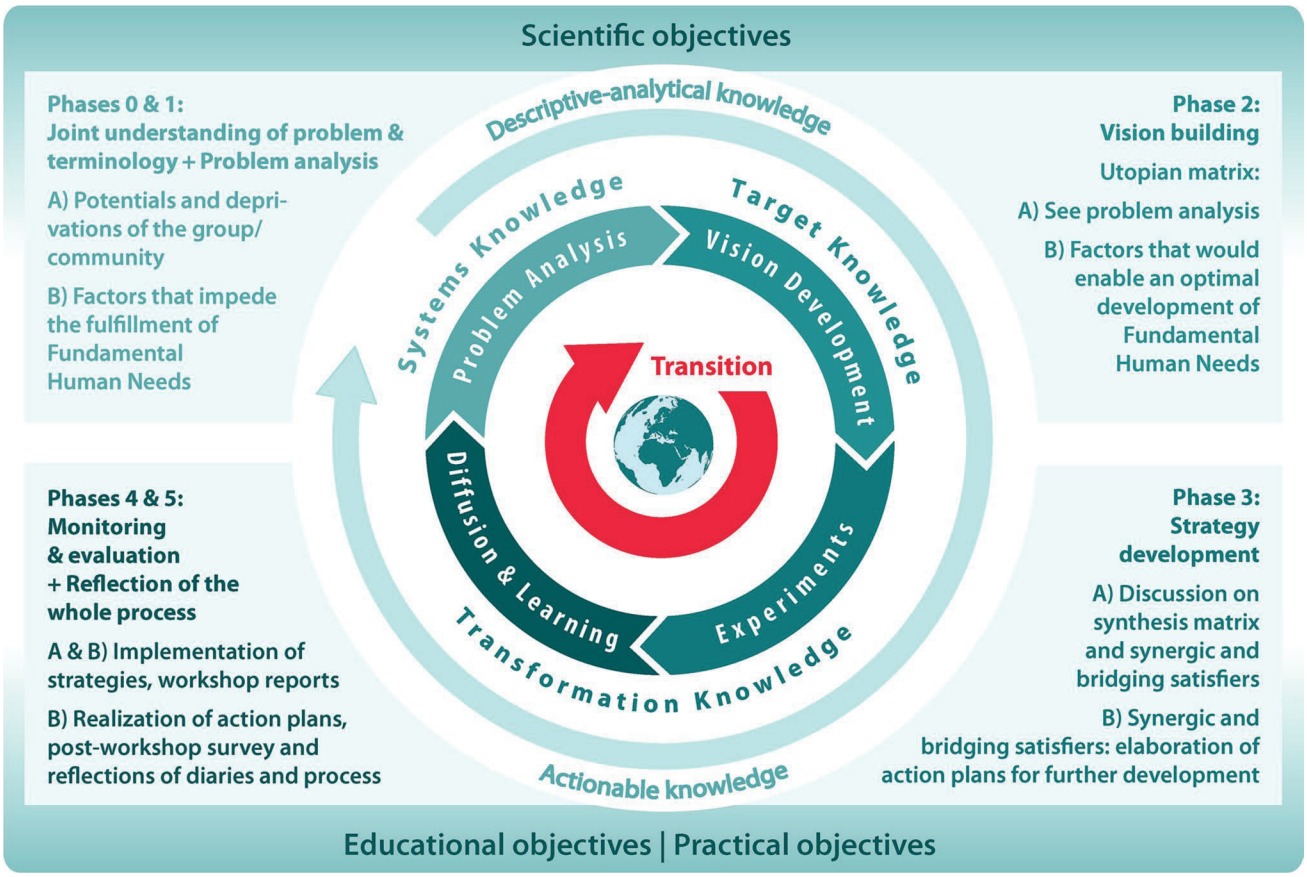

Fig. 5 HSDA processes as proposed by Barrera (**A**) and Spiering (**B**) contribute toward generating knowledge for TSc and achieving TSc objectives (adapted from Transition-Cycle, source: Wuppertal Institute (Bierwirth et al. 2017:31))

with a broader understanding of needs affects personal and policy-related decisions alike (Guillen-Royo 2016). Synergic bridging satisfiers can be considered as "sustainable" not only in relation to environmental issues, but also to social sustainability issues (Pelenc 2014; Olivares-Aising and Barrera 2019) and economic sustainability challenges (Guillen-Royo 2016; Göpel 2016). So far, this is an assumption, and we cannot claim that all synergic strategies are inevitably sustainable. The theoretical foundation of HSDA may be better integrated within sustainable development debates. It would certainly be worthwhile building further on the work of Pelenc (2014), who combines HSDA with Sen's capability approach to strengthen HSDA's theoretical foundation. Further reflection is needed regarding the outcomes of normatively oriented HSDA processes.

Reflection on FHN within HSDA induces mindset shifts that are also necessary for changing the scientific system

Recent literature on mindset shift stresses the need for a shift in paradigms and individual worldviews to face sustainability challenges (Göpel 2016; Wamsler et al. 2020). In this regard, Omann and Rauschmayer (2011:145) state that "a transition towards SD requires that actors start by looking into their inner side, reflecting upon one´s values, feelings, world views and being open and prepared to develop". HSDA enables such reflection on multiple levels: it provides not only knowledge necessary for transformations, but also scientific understandings of a process based on reflection about FHN as well as individual and social learning processes. This inclusion of human feelings, values and needs provides new perspectives for TSc, as reflection occurs among participants and scientists alike. Pereira et al. (2020) call these processes of joint knowledge production that include consideration of emotions and empathy "humanizing solutions" that are socially relevant, personal and political**.** In a similar vein, HSDA processes may contribute toward transforming the science system itself, which is one objective of TSc**:** in the CEM case, students were educated and trained in HSDA theory and practice, while the other author has advised and trained other researchers to disseminate knowledge about practical HSDA applications (de Schutter et al. 2019). The science system will not be challenged by single projects, but nonetheless the very implementation of TSc projects has an impact on the science system itself (Moser 2016; Vogt and Weber 2020).

Limitations and future research

In addition to some of the above-mentioned drawbacks to HSDA, we now outline some further limitations associated with conducting HSDA processes as well as more general challenges and implications when applying it as TSc.

With regard to the process of reflection on needs, it was clear that discussion at the personal level sometimes prompted silence, discomfort or even unease among participants. In this respect, it is all the more important to "create a safe learning space for learning and trust building", but also to "embrace discomfort as a learning opportunity" (Hölscher et al. 2021).

Another highly topical challenge for conducting participatory research in general is the current coronavirus pandemic, which is making it difficult to create open spaces for dialogue (Engler et al. 2021). Within this context, the authors have started to experiment by conducting HSDA processes with students of higher education in virtual settings. Future efforts should be undertaken to test the empirical efficacy and robustness of virtual and/ or hybrid formats.

HSDA processes are limited regarding the continuity of the iterative learning process; although "risky" and "time-consuming", the value of prolonged collaborations should be acknowledged (Jaeger-Erben et al. 2018:64). Several authors have begun demanding appropriate funding policies and respective project design for longer term TSc and transformation research (Caniglia et al. 2020; Defila and DiGiulio 2020; Bergmann et al. 2021). The highly aspirational threefold objective of TSc places considerable demands on all those involved (Bergmann et al. 2021; Defila and DiGiulio 2020): "this requires special and careful attention with regard to dealing with issues of legitimacy, a good management of expectations, and a reflective balancing of opportunities and threats" (ibid:64). Special attention should be drawn toward ensuring that HSDA processes can occur with no prejudgement of the outcomes, in order not to fall into the trap of believing that HSDA outcomes must necessarily be "transformative" (Jaeger-Erben et al. 2018).

Thus, further emphasis needs to be placed on reflecting about the outcomes of normatively oriented HSDA processes, developing further systematisations for HSDA reflections, and grounding HSDA theoretically in TSc. Future research could fruitfully reflect on related approaches by means of the blueprint presented here. For all the flexibility of the approach, however, reflection on the roles of the researchers and their impacts, values and objectives requires deeper analysis; in this article, we have referred only briefly to the issue of reflexivity and inner change (Parodi and Tamm 2018). More documentation of and experimentation with HSDA applications is needed to further develop the approach as a tool for TSc. To boost the uptake of our versions of HSDA, it would be feasible to publish open-access facilitation guidelines on platforms such as the USYS TDLab toolbox. The presented analytical framework can be applied to assess the quality of other TSc methods accordingly.

We conclude that our adapted HSDA methodologies inform TSc by being grounded in a theoretical basis, being highly flexible and normatively oriented, and by linking

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needs with sustainability. With its unique perspective on fundamental human needs and respective synergic satisfiers, HSDA provides alternative ways of understanding and catalysing sustainability transitions and inducing mindset shifts. We encourage other researchers to apply the adaptations presented here and to experiment with their valuable main components. HSDA is not presented here as the sole problem solver, but it may constitute one approach for catalysing actionable knowledge for sustainability transitions. We invite critical reflection on these issues and hope for further empirical testing and development in support of TSc on the basis of shared reflection on a human scale.

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Appendix A.2

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Salina Spiering, María del Valle Barrera

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How to?! Practical knowledge for transformative science — facilitation guidelines for two applications of the Human Scale Development approach

Authors: Salina Spiering[1], María del Valle Barrera[2]

1 Helmholtz Centre for Environmental Research GmbH – UFZ, Permoserstraße 15, 04318 Leipzig, Germany, salina.spiering@ufz.de, Phone +49 341 235 1793

2 Institute of Economics, Faculty of Economic and Administrative Sciences, University Austral of Chile, Isla Teja, Valdivia, Chile, mvallebarrera@gmail.com

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Abstract

Multiple methods for transdisciplinary and transformative sciences have been presented and discussed in the literature on sustainability. Wider knowledge, however, on how to implement global environmental change is still sought for. We suggest that understanding the practical knowledge with the Aristotelian concept of *technē* and *phrónêsis* provides important contributions for change. With the present paper we will build on the detailed facilitation guidelines for the application of the Human Scale Development approach (HSDA) that were introduced in the early 1980´s. Although the approach has been applied and adapted during the last three decades, a particularised description of the facilitation process it requires is lacking. The same gap of information resides with regard in many other methods in transdisciplinary and transformative sustainability sciences. As a contribution of "how-to" practical knowledge within transformative science can be applied we present two detailed facilitation processes of adaptations of the original HSDA. With these contributions we would like to encourage other scholars and practitioners to test and validate the presented applications and further develop them in their own settings as well as for their own purposes.

Keywords

Human scale development approach, transformative science, how-to practical knowledge, facilitation process, participatory methodology, *technē* and *phrónêsis*

Content

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1 Introduction and background

1.1 Why "how-to" knowledge is important and why we think HSDA contributes to gaining practical knowledge

Within transdisciplinary and transformative science the need for how-to practical knowledge for change is increasingly emphasised (Sharpe et al. 2016, Fazey et al. 2018). Traditional academic knowledge often does not consider knowledge needed for implementing change in practice. Fazey et al. (2018: 56) state: "Yet despite the vast amount of knowledge already accumulated, there is still limited emphasis on understanding how to implement change. This 'how to' question is now arguably the most important question for climate research". Sharpe et al. (2016) as well as Fazey et al. (2018) draw on the distinction between *episteme* (analytical knowledge), *technē* (productive knowledge) and *phrónêsis* (ethical knowledge) presented by Aristotle (2004) to deduce the need for "how-to" practical knowledge for sustainability transitions. Sustainability science (Kates et al. 2001) challenges the objectivity of science and argues that other forms of knowledge need to be recognised. As Martin (2015) argues, the primary focus within academia on epistemic knowledge does not include prescriptions of action and tends to ignore questions of values.

Epistemic knowledge "is logically built up and then applied back to practice (Aristotle 2004). Such knowledge is teachable and often represented as a set of principles or guidelines" (Sharpe et al. 2016: 47). Epistemic knowledge is disembodied from doing and criticised as "the only pure knowledge, elevating it to a superior knowledge" (Harcourt 1994: 19). Flyvberg (2001) argues that especially natural sciences pursuits to gain epistemic knowledge. A mere focus on epistemic knowledge is thus insufficient for the facilitation of change processes that are required to face and facilitate sustainability transitions. A focus on practical knowledge that includes *technē* as well as *phrónêsis* is urgently needed (Sharpe et al. 2016, Fazey et al. 2018). By *technē* Aristotle (2004) describes "know-how" knowledge that is embedded in practice such as crafts or skills that are based on practice (also communication skills), often passed down from one generation to another (Harcourt 1994, Martin 2015). In contrast to epistemic "know-why" knowledge, *technē* "know-how" knowledge entails normativity (Flyvberg 2001). *Phrónêsis* is understood as prudence or practical wisdom (Aristotle 2004) and includes values and ethical deliberations into decisions and practical action (Flyvberg 2001, Martin 2015). For Shotter and Tsoukas (2014: 232) "*phrónêsis* is no mere intellectual effort but more crucially an aspect of 'who' one would like to be" to achieve "good ends". Flyvberg associates *technē* and *phrónêsis* with social sciences and states that social science contributes "to the reflexive analysis and discussion of values and interests, which is the prerequisite for an enlightened political, economic, and cultural development in any society" (Flyvberg 2001: 3). Martin (2015) proposes to introduce *technē* and *phrónêsis* within sustainability science, because sustainability naturally entails subjective and normative assumptions.

Other scholars (Sharpe et al. 2016, Fazey et al. 2018) state that *technē* and *phrónêsis* are not well recognised within academia (apart from action research, transdisciplinary and transformative research, all of which still struggle to be valued within academia). This would often lead to the production of scientific knowledge that does not meet the needs of practice or would not be considered as scientific insights by practitioners. Sharpe et al. (2016) point on a "gap" between science and practice and argue that the Aristotelian concept serves as bridge between them. Fazey et al. (2018) present Hopes´ (2016) conceptualisation of research around practice (1. research into practice (researchers observe practice), 2. research for/as practice and 3. research through practice) to show that within research through practice "the emphasis is more towards developing the practice (*technē* and *phrónêsis*) rather than the epistemic knowledge about that practice" and that "shifting towards research through practice […] has major potential for encouraging a more engaged and rapid approach to transformation research" (Fazey et al. 2018: 61f). Sharpe et al. (2016) as well as Fazey et al. (2018) stress the urgent need for supplementary forms of knowledge production and

assessment within academia that contribute to the facilitation of contemporary social and environmental change processes.

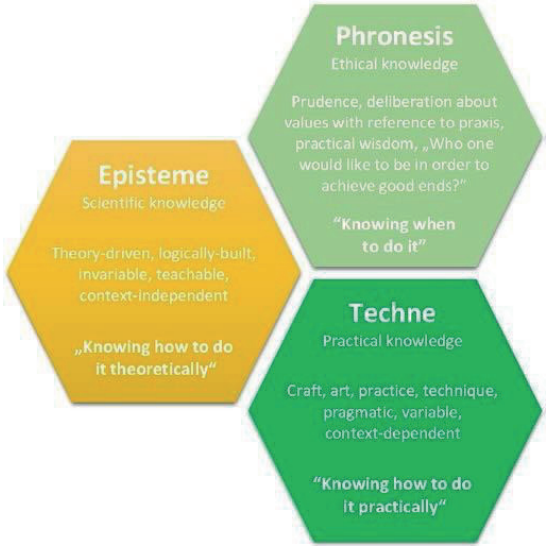

Figure 1: Different forms of knowledge

In response to the need for more how-to practical knowledge productions, this paper presents the Human Scale Development Approach (HSDA) introduced in the 1980s by the Chilean economist Manfred Max-Neef and his colleagues (Max-Neef et al. 1989) and specifies how it can be applied in practice. The HSDA as theory and methodology provides a useful option to practically and scientifically face sustainability transformations towards a low carbon society and meet the Sustainable Development Goals (SDGs). However, the HSDA is barely known, its use has not been adapted to current needs or systematised, and its epistemic scientific use is hardly evaluated to inform current transformative challenges. To address these flaws we adapted the original proposal of Max-Neef et al. (1991) and further developed the practical procedures in several case studies in Germany and Chile. We follow the procedure of Sharpe et al. (2016) to articulate a how-to practical knowledge guide, thereby we present the HSDA and how we applied it in practice (*technē*) thus reflecting on the contributions of the applications for a value-driven research practice (*phrónêsis*).

In the first part of this paper we show the need for practical "how-to"-knowledge for facilitating transformative science methodologies and how the Aristotelian concept of *technē* and *phrónêsis* facilitates the discussion on practical know-how. We then propose the HSDA as a valuable practical approach to facilitate change processes. In the 2nd section we introduce the original version of the HSDA as well as further adaptations applied by scholars and practitioners. In section 3 we present two detailed applications that serve as facilitation guidelines and valuable tool-kits to facilitate change processes. We close by discussing insights on the practical knowledge gained through the applications of the adapted methodologies and present open practical and research questions.

1.2 About the Human Scale Development approach and its different applications

1.2.1 Original proposal of the HSDA

The Chilean economist Manfred Max-Neef and his colleagues established a matrix of Fundamental Human Needs (FHN) and satisfiers at the methodical core of the HSDA (Table 1) (Max-Neef et al. 1986)[1]. The aim of their

[1] The theory was published for the first time in 1986 (Max-Neef et al. 1986), and was edited in 1994, 1998 and 2006 by Icaria

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approach (and, hence, of the matrix) is to empower local communities in rural and urban areas. Human Scale Development is defined as "focused and based on the satisfaction of fundamental human needs, on the generation of growing levels of self-reliance, and on the construction of organic articulations of people with nature and technology, of global processes with local activity, of the personal with the social, of planning with autonomy, and of civil society with the state" (Max-Neef et al., 1992: 197). The main actors in the HSDA are people called “protagonists in their future” (ibid.: 198). Max-Neef et al. (1986) developed both, a taxonomy of human needs and a process by which communities can identify their "wealths" and "poverties" according to how these needs are satisfied.

Max-Neef et al. (1991) describe human needs as few, finite and classifiable. They suggest that FHN include subsistence, protection, affection, understanding, participation, creation, idleness, identity and freedom. Later the authors considered to insert a tenth need for spiritual development that they call transcendence. Those needs are assumed to be constant through all human cultures and across historical time periods. What changes, both over time and across cultures, is the way or the means by which needs are satisfied (Max-Neef et al. 1991: 199f.). These satisfiers can be either the idea or realisation of how needs are to be fulfilled, taking into account internal abilities and external circumstances. To fulfil, for instance, the need for subsistence, appropriate satisfiers may be food, water and shelter; whereas the concrete strategies may vary from walking a few kilometres to a water well, drinking tap water or going into a supermarket to buy a bottle of water. The satisfiers are then classified as singular, synergetic, destructive, inhibiting or as pseudo-satisfiers, according to the way in which they fulfil one or several needs. The differentiation between needs and satisfiers is a main aspect of the HSDA.

In contrast to Maslow´s theory (1987), there is no hierarchy in Max-Neef´s approach with an exception in the need for subsistence, that is, to remain alive (Max-Neef et al. 1992: 199). Needs can be satisfied along the existential categories of being (personal or collective attributes expressed as nouns), having (institutions, norms, mechanisms, laws, goods etc.), doing (personal or collective actions expressed as verbs) and interacting (locations and milieus). “Each need can be satisfied at different levels and with different intensities. Furthermore, needs are satisfied within three contexts: with regard to oneself (Eigenwelt); with regard to the social group (Mitwelt); and with regard to the environment (Umwelt)” (Max-Neef et al. 1992a: 200). From these dimensions, a 36 cell matrix is developed which, in the participatory community process, is to be filled in by the ways in which the community /the individuals of the community satisfy their needs (Table 1). The proposed methodology was firstly introduced in the English version in 1991 and consists of seven phases. Phase 1 is a preparation phase where groups are divided into sub-groups and a matrix of needs and satisfiers for further collaboration is presented. In Phase 2 the sub-groups fill in the empty grids with negative satisfiers for being, doing, having and interacting with the support of a trained facilitator. Finally certain numbers of negative matrices exist, dependent on the number of sub-groups. In phase 3 a group of volunteers consolidates the sub-group-matrixes into one so called consolidated negative matrix. In phase 4 nine groups for each of the nine FHN are built and discuss the most important and decisive satisfiers from each of the four axiological categories. In phase 5 each of the nine groups delivers the list of negative satisfiers selected and unites them together in a new synthesis matrix. This represents the picture of the most negative elements affecting that society, community or institution (as perceived by the participants). A discussion and interpretation of the synthesis matrix is then carried out in a plenary session. For the whole process on the negative matrix Max-Neef et al. (1991)

(Max-Neef et al. 1994, 1998, 2006). It was translated into English in 1989 in the Magazine Development Dialogue, and then published as a book in 1991 by The Apex Press (Max-Neef et al. 1991). It was translated and published in German in 1990 with the name “Entwicklung nach menschlichem Maß: eine Option für die Zukunft” (Max-Neef et al. 1990). More recently, in 2011 it was translated and published in Italian by Slow Food with the title “Lo sviluppo su scala umana” (Max-Neef et al. 2011) and in 2012 it was published in Portuguese by Edifurb with the title “Desenvolvimento à Escala Humana-Concepção, Aplicação, Reflexos Posteriores” (Max-Neef et al. 2012). In 2009, Wayne Visser of the University of Cambridge included it in his ranking ‘The top 50 sustainability books’ positioning it as one of the 50 most influential books on sustainable development (Visser 2009).

propose a two days workshop. This refers to one of the main criticisms that the proposed approach is very much time consuming. Phase 6: Employing exactly the same procedure as for the construction of the negative matrix (phase one to five), the participants are asked to produce the matrix of their Utopia; that is, of how society ought to be for them to feel really satisfied. In a last phase and at the end of the construction of the utopian matrix or in a third plenary encounter, the participants are confronted with both synthesis matrices: the negative and the positive to discuss about bridging both matrices finding synergic satisfiers. "The matrix of needs and satisfiers may serve, at a preliminary stage, as a participative exercise of self-diagnosis for groups located within a local space. Through a process of regular dialogue—preferably with the presence of a facilitator acting as a catalysing element—the group may gradually begin to characterise itself by filling in the corresponding squares" (Max-Neef et. al 1991: 37). The proposed classifications of satisfiers can be used for analytical purposes.

Existential categories/ Fundamental Human Needs	Being (qualities)	Having (things)	Doing (actions)	Interacting (settings)
Subsistence	physical and mental health	food, shelter, work	feed, clothes, rest, work	living environment, social setting
Protection	care, adaptability, autonomy	social security, health systems, work	cooperate, plan, take care of, help	social environment, dwelling
Affection	respect, sense of humour, generosity, sensuality	friendships, family, relationships with nature	share, take care of, make love, express emotions	privacy, intimate spaces of togetherness
Understanding	critical capacity, curiosity, intuition	literature, teachers, policies, educational	analyse, study, meditate, investigate,	schools, families, universities, communities,
Participation	receptiveness, dedication, sense of humour	responsibilities, duties, work, rights	cooperate, dissent, express opinions	associations, parties, churches, neighbourhoods
Idleness	imagination, tranquillity, spontaneity	games, parties, peace of mind	day-dream, remember, relax, have fun	landscapes, intimate spaces, places to be alone
Creation	imagination, boldness, inventiveness, curiosity	abilities, skills, work, techniques	invent, build, design, work, compose, interpret	spaces for expression, workshops, audiences
Identity	sense of belonging, self-esteem, consistency	language, religions, work, customs, values, norms	get to know oneself, grow, commit oneself	places one belongs to, everyday settings
Freedom	autonomy, passion, self-esteem, open-mindedness	equal rights	dissent, choose, run risks, develop awareness	anywhere
Transcendence	inner centeredness, presence	religions, rites	pray, meditate, develop awareness	places for worship

Table 1: Matrix of needs including examples of corresponding satisfiers in four categories [adapted from Max-Neef et al. (1991: 32f.)]

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The HSDA is a practice of self-empowerment and its task is to empower people to better realise their needs. "Central objectives of this approach remind us of the importance of the real prominence of people that result within autonomous societies. To achieve the person´s transformation from the object of development into its subject is certainly the end of the process. In this understanding, since human beings represent active components along the development process, [HSDA] stands for no particular development model, nor for final or definitive solution. This approach entails a theory of human needs for development, one that goes beyond economic rationality and comprehends the human being as a whole" (Cruz 2006: 67).

1.2.2 Aim and use of the HSDA

Max-Neef developed his approach mainly in response to the Latin American crisis in the 1980´s as a critique to the two schools of economic thought which prevailed in the Latin American setting, neoliberal monetarism and the more interventionist state-centred developmentalism promoted by the Economic Commission for Latin America, "that have not been able to satisfy legitimate needs of the Latin American masses." (Max-Neef et al. 1991: 7) The aim is to transform the "traditional, semi-paternalistic role of the Latin American State into a role of encouraging creative solutions flowing from the bottom upwards." (ibid: 8). They state this would be more "consistent with the real expectation of the people" (ibid: 8). But although the approach was developed within a Third World context, its application is conceivable in any other society as Max-Neef et al. (1998: 213) state and as has been shown by Camfield and Guillen-Royo (Camfield and Guillen-Royo, 2010; Guillen-Royo, 2010) as well as by Jolibert et al. (2014).

Since its first publication Max-Neef et al. (1986) dedicated to develop the workshop methodology to implement the HSDA. Although the authors provide a "matrix type" as an example the proposed methodology is based on the collective filling of an empty matrix. Its content is not normative, but a heuristic device of a particular group or community at any given time. While the matrix is a methodological tool and not an end in itself, one of its potentials is that its application generates a reflexive and critical attitude for diagnosis, planning and evaluation. As Max-Neef's original methodology involves many people and a lot of time, the HSDA has been developed further to less time- and people-intensive formats and adapted to a multitude of contexts. The original approach has also been criticised for being presented in "quite complex ways, which are not particularly user friendly" (Rogers 2005: 118).

1.2.3 Variations of original proposal

Many academics and practitioners have adapted the original proposal and combined it with other methodologies: fill the matrix from secondary sources (Cruz et al. 2010), use the opinions of groups of experts (Zulueta 2010) or use interviews or questionnaires analysed with content analysis or Likert scales (Lozano et al. 2011; Nangombe and Ackermann 2012). Many applications of HSDA theory and practice occurred within social work and to improve social sustainability especially in South Africa and Latin-American: Clarke (1993) applied the HSDA in certain case studies in South Africa and developed a wheel of FHN and satisfiers. Du Toit (1998: 15) provided a collection of papers for peace- building and community building in South Africa and presents the HSDA to design and implement structures for creative management of conflicts and development on a human scale. Lorenzo (2001) conducted a study on Disabled People South Africa (DPSA) to improve their access to opportunities for social integration and economic independence as part of community-based rehabilitation.

Carbone (2004) analysed her participatory observations and in-depth interviews with beneficiaries in Colombia on the basis of HSDA. Luna et al. (2012) used a quantitative methodology based on the HSDA with 2,845 representatives from 556 social, corporate, and public organisations of 34 Colombian municipalities to know the needs of people in Bajo Magdalena, Colombia. Zulueta (2008) worked on neglected needs of homeless people and how they could be met in Chile using the HSDA framework. The Argentinian social worker Jorge (2010) recommended to consider HSDA as different approach towards human needs to address patients' needs and satisfiers in end-of-life care. Thompson

and McKeever (2012) filled in the matrix in cases of patients of aphasia to show that nursing interventions must address all needs to provide holistic care in its fullest sense. Betancourt and Nahuelhual (2017) conducted in-depth interviews (life-history method) that relied on the HSDA and wanted to explore how wellbeing is built through social practices related to the use of products of natural medicine in local communities of southern Chile. Within the context of environmental sustainability the HSDA has been applied for more or less the past ten years Max- Neef himself together with Stahel and Cruz (Cruz et al. 2010: 2028) proposed extensions of the HSDA methodology to "help/assist institutions working with policymaking processes related to development and social issues as well as individuals, communities and other stakeholders by enhancing and complementing the originally proposed H-SD methodology." They put forward an evaluation tool consisting of a situational and propositional matrix that intends to give a constructive and dynamic picture revealing changes between one and the other whenever satisfiers are proposed coherently and enhance synergetic actions.

Gonzales (2010) conducted a (quantitative questionnaire) case study in three Australian ecovillages to understand the search for environmental sustainability and social sustainability as needs fulfilment and concerning quality of life of the ecovillage inhabitants. In 2011 Hitchcock and Willard (2011) of the International Society of Sustainability Professionals used the HSDA taxonomy to assess the social sustainability of enterprises stakeholders (employees, suppliers, customers, community). Lamb and Steinberger (2017) conducted a review on climate change mitigation research and discussed the HSDA as eudaimonic tradition to development. They conclude these eudaimonic approaches (by defining what is necessary for a flourishing life) are "better-suited to inform climate change mitigation research than hedonic or happiness approaches" (Lamb and Steinberger (2017: 10). Garcia Ochoa and Graizbord (2016) propose an alternative measurement of energy poverty in Mexican households based on HSDA. They consider energy services as satisfiers, where energy is not an end in it self but a means to satisfy FHN. Brand-Correa et al. (2018) investigated in two Columbian case studies how energy services contributed to human well-being and adapted the HSDA methodology to collectively construct energy services. Recently Vita et al. (2019) obtained a cross-sectional analysis to calculate the carbon and energy footprints of FHN using 35 objective and subjective indicators to evaluate human needs satisfaction and their associated carbon footprints across nations. In a study on analysing the conflict of interest between fish farming and otter protection in Portugal Jolibert et al. (2011) even proposes to apply the HSDA including the needs of non-humans.

Several scholars conducted HSDA workshops based on the original proposal but mostly with variations. Thereby results descriptions in most of the cases dominated methodological descriptions. Cuthill (2003) run a HSDA workshop on the Gold Coast in Australia. The rationale for the workshop was to conduct a forum that allowed citizens who work on community-based issues an opportunity to identify, explore and reflect on 'causal' social issues which undermine the Gold Coast community. Rogers (2005) conducted 20 focus groups in five small rural communities in central Victoria, Australia, working intensively on the nine FHN and integrating an artist producing a theatrical performance.

Picón et al. (2006) conducted HSDA-workshops to understand the realities of Colombian migration groups based on an ethnographic and social work research. Bucciarelli and Alessi (2013) provided a detailed workshop description in Italian language (only) to "a) getting comparable data, b) for developing a new index for measuring social well-being as well as the efficiency of local social policies, and c) for introducing the Human Scale Development into the scientific fields of the Experimental Economics (field experiments) and of Agent-based computational Economics (ACE)" (Bucciarelli and Alessi 2013: 1). They added a tenth need for "sustainability" in the axiological category. Guillen-Royo conducted HSDA workshops with participants in Spain, Peru and Norway and draw up a comprehensive reflection on Human Scale Development and Sustainable Development (Guillen-Royo 2010 and 2015). Pelenc (2014) combined Amartya Sen´s capability approach (Sen 1999) with Max-Neef's HSDA "for a better assessment of multidimensional well-being and inequalities" and conducted a case study with participatory workshops and a

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questionnaire survey with vulnerable teenagers of the region of Paris to test the presented framework. Olivares-Aising and Barrera (2019) performed a participative evaluation of a national public policy implementation with three psychosocial work teams in Mental Health in southern Chile.

Practitioners and consultants have also made interesting contributions to HSDA methodology and have developed important insight about the way HSDA can be used in organisations and businesses to achieve sustainability. Renoldner (2012) proposed a detailed concept for Global Learning through global and political constellations as an approach to adult education based on FHN. "The author shows how this concept can be used, perceived and visualised in space in the form of a constellation for an entire group" (Renoldner 2012: 8). The transition town movement based parts of its methodology on needs and satisfiers proposed by Max-Neef et al. and has spread their use throughout Europe and beyond (i.e. the work of Inez Aponte in the Well and do Project[1]).

All these different uses and forms of application have enriched the original methodology. However, despite its application in different contexts, as yet, there has been limited critical explanation (*technē*) and examination (*phrónêsis*) of the HSDA adaptations. In the following we present and critically examine our adaptations to provide how-to practical knowledge.

2 How to facilitate a Human Scale Development process

2.1 How to facilitate the HSDA application as adapted by Barrera

The following methodology proposal is the result of the application of 10 workshops that took place in Valdivia, Chile in different contexts of the University Austral of Chile and the Master Programme on Human Scale Development and Ecological Economics, between 2013 and 2018 (Barrera 2017). Workshops were part of research projects founded by Entrepreneurial Learning Center and the National Agency for Research and Development "Entrepreneurial Elderly: Inter-institutional community revitalizing program for self-worth and subjective well-being of elderly" (FONDEF-ID16AM0074). A detailed facilitation manual in Spanish can be found in Appendix 4.

For a better understanding of the methodological process of the matrix workshop, three different (independent but connected) modules are presented. From our experience modules work as units, in the sense that if concluded successfully they can provide validated data for research and practice. Variability of time disposition, assistance, and other circumstances lead us to more flexible use of the workshop to maintain its credibility, transferability and consistency.

[1] https://wellandgoodproject.wordpress.com

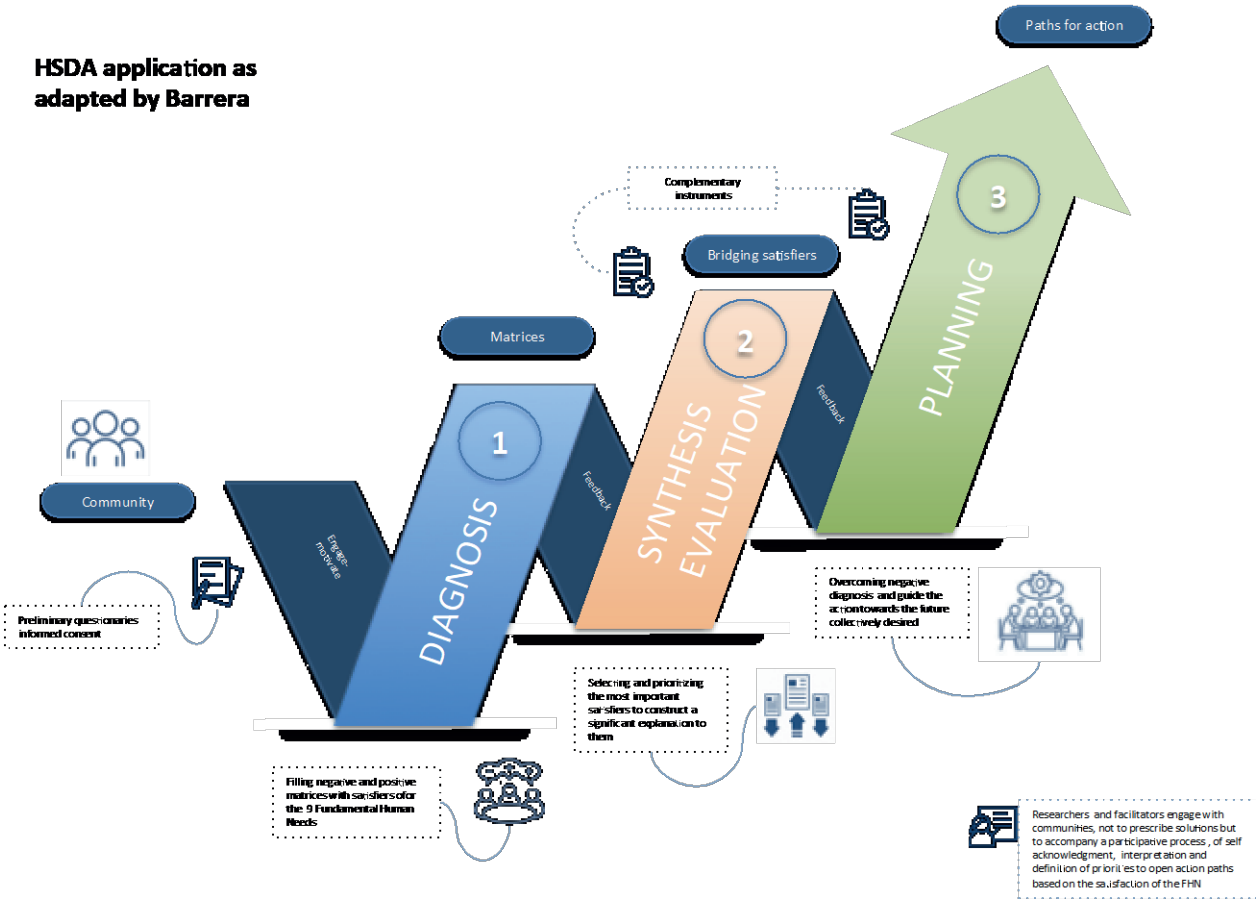

Figure 2: HSDA application as adapted by Barrera

Module 1: Diagnosis module

The HSDA methodology can provide a broad and deep diagnosis on how satisfied the needs of a human group are. The goal of workshop module 1 is to fill the matrices with satisfiers of FHN for the axiological needs: being, having, doing and interacting. In our updated methodology, the search for the satisfiers differs from the original proposal from Max-Neef et al. (1986) in two main aspects:

(i) It is oriented towards the identity of the group

(ii) It simultaneously searches for positive and negative satisfiers

With shorter time dispositions and project-oriented goals, workshops do not intend to identify how the whole community satisfies their FHN. Instead, the focus is on the identity of certain groups right from start: how do we (as old people, entrepreneurs, indigenous, students) satisfy our FHN?

At the beginning of the module we apply a 15 minutes reflexive motivation activity that attunes participants with the identification of certain roles. This introductory activity should motivate the conversation but also encourage participants to talk on behalf of others freely and legitimately. For example: Why can I talk about the way young people satisfy their needs when I am a grown-up adult? Either by appealing to their memory, to their parenthood, or to their roles as teachers. This activity entitles participants to contribute in the name of a certain group.

The discussion on the FHN follows. For that purpose, a poster for every FHN is arranged on the walls of the room. On each poster the need is written in the center and it is divided into four quadrants, in which the words being, having, doing and interacting are written in every corner (Figure 3). Depending on the number of participants, sub-groups are formed (from 1 to 4). Each group is seated in front of one, two or even three posters, discussing one need at a time. The conversation starts with guiding questions that are presented by the facilitators and written and

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posted on the wall:

- For being: How are we? How do we want to be?
- For having: What resources do we have? How are our institutions, norms, and practices? (Do not register objects)
- For doing: What do we do? What would we like to do?
- For being: What and how are the spaces and places of our interactions?

Negative satisfiers are written in one colour on adhesive paper and positive satisfiers in a distinct differing colour. The groups define satisfiers in one word or sometimes a short sentence that synthesises the idea of an opinion or the conversation. Everyone can write and place satisfiers on the posters, and it is highly recommended that the whole group agrees on the satisfier and its wording. Dissent should not be a problem as long as an additional satisfier (another adhesive paper) can be placed on the poster. For example, the use of cell phone or IT, in general, is ambiguous as they can be associated with positive and negative practices regarding understanding and communication. In such a case, it is crucial to adjective the practice, such as excessive use of cell phone, or using WhatsApp to help a friend.

In the first module facilitation is crucial, not only to ensure fluent, respectful and inclusive participation of all the attendees but also to assure time goals and relevant results. Experienced and trained facilitators support participants by their interpretation skills to catch ideas and not to interrupt the conversation.

Additionally, working negative and positive satisfiers together assumes that present satisfiers are not only negative, and positives are only in a utopic scenario, but a mix of both. Therefore, the focus is not a radical change but a transition that starts with the self-awareness, identification and overcoming harmful practices, institutions, values and spaces of the interaction with the potentiality of the ones considered presently and utopically positive.

When the conversation about one need reaches a saturation point, the group moves to the next one. If there is more than one group, they can rotate to other uncompleted needs or complete the previously work by another group. In such a case, one member of the group can stay next to the poster and present the results to the new group. This validation-rotation exercise is critical as everyone can accept and add satisfiers. The presentation of satisfiers as results of the group discussion empowers participants that present them as a self-diagnosis, and reduces the role of the researcher in a counterhegemonic flow. The time of the first module varies from one workshop to the other. When there is enough time rotation, validation and presentation instances can be extended.

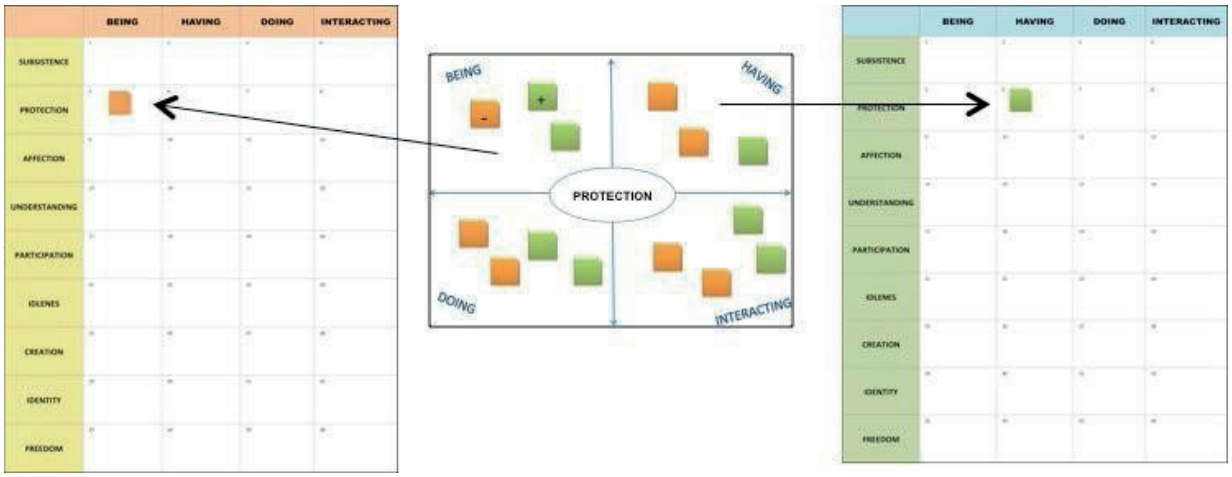
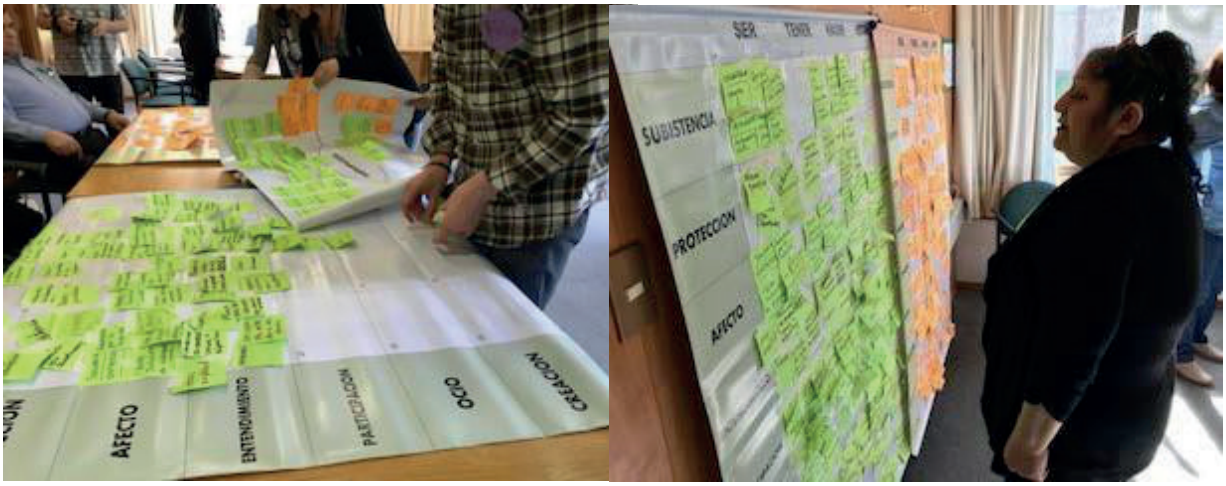


Figure 3: Module 1 – how to fill in the positive and negative matrix through the discussion of posters per FHN

To finalise module 1, two big empty matrices are presented to the group (in contrast to the original version, until this moment the HSDA matrix is not presented to the participants). Volunteers transport negative and positive satisfiers from each quadrant of the poster to their correlative ones in the matrix (Figure 3). In less than 30 minutes both matrices are collectively formed and the whole group can look at them carefully as the result of the workshop. Closing remarks on the activity, the theory, the following modules and the application of other instruments (see B) are pertinent before a break. From module to module, brakes can be meals, or days depending on the logistic planning of the workshop.

Altogether module 1 with the presentation, motivation, search for satisfiers, rotation and/or presentation of results and transfer to the matrix in our cases took 2.5 to 3 hours and a maximum of 4.5 to 5 hours including breaks and coffee/water disposal inside the room.



Photos 1: Filling in the matrices in a workshop with elderly in Valdivia.

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What happens if it is not possible to continue with the other modules? As it occurred in some of the workshops, for logistic reasons, the characteristics of the participants or even events out of the researcher's control, the fulfilment of the two matrices is the only module possible to hold. In that case, the researcher will have enough amounts of data to process with valid results. It is essential to take into consideration some advice on complementary instruments (explained in part B) and community devolution of results (developed in part C). In such a case, the initial and complementary collection of data was instrumental to triangulate and validate the results.

2.1.2 Module 2: Synthesis and evaluation module

Within module 2 the process of synthesis and interpretation is dynamic and should be focused on one specific goal: it is the participants, who interpret, select and prioritise the most important satisfiers to construct a significant explanation to them. This implies guiding and facilitating a new validation of the previously constructed matrices, and leads to a simplification to reduce the number of concepts and satisfiers.

Having finished the diagnosis of the two matrices, two groups are formed around each completed matrix (that are visually cleaned if possible). Participants are able to read more carefully and analyze the previously agreed satisfiers. In this case, the group is requested to select one satisfier for each grid collectively through a conversation. The selected one should be coloured on the grid and transcript to a card. This is the equivalent of the synthesis matrix of the original methodology.

As a new and vibrant conversation can take place to reach an agreement, it may be the case that the same satisfiers are repeated and selected for more than one grid. It can happen to have more than one in a grid and none selected for others of the same need.

With the selected satisfiers written on cards, the groups are asked to put them in (some) order and explain how they are related. Without the structure of the matrix, satisfiers are classified, prioritised and interpreted by the group constructing an explanation. Instead of 36 synthetic satisfiers in a matrix, the results are about 20 to 25 needs satisfiers set them in a significant order for the group.

After finishing that part, volunteers present the result and their explanation that synthesises the matrix simultaneously evaluating and giving them an order (structure) and significance. Categories arise in these explanations, and the group tends to gather satisfiers of some kind: external, internal, etc. From our experience, only in some cases the proposed classification of satisfiers suggested by the book namely: (a) violators or destroyers, (b) pseudo-satisfiers, (c) inhibiting satisfiers, (d) singular satisfiers, and (e) synergic satisfiers is meaningful to researchers or to participants only if they previously know it. Nevertheless, all categories that arise from the workshop participants, the researcher's interpretation or the theory, they are all essential for analytical purposes.

What happens if it is not possible to continue with the next module? In that case, the researcher will have sufficient data to process with valid results, and the first interpretation and prioritisation of the results made by the participants.

With the end of module 2 the appropriation of the diagnosis by the participants and the empowerment to speak out in front of a significant audience turns out to be an unquantifiable result. In some occasions, the satisfiers identified as more important in this module may coincide with the results of surveys of national representation held by the universities or even the state. What's new in this? A difference then is the counterhegemonic position of a researcher or a technical professional of a ministry who comes to say "what they need." Diagnosis, synthesis and its first evaluation emerge as self-knowledge and self-awareness, opening up possible paths for the third module.

2.1.3 Module 3: Planning for action

How to overcome the negative diagnosis and guide the action towards the future collectively desired? This third module involves exercises to guide and focus on practical action towards social change. It includes at least two processes: (a) bridging and (b) prioritizing for action.

The first part consists of finding possible paths that overcome the negative diagnosis of satisfaction. "Bridges" are groups of possible and desired paths, not only actions (things to do) but also values (of the being) that will guide them, shared resources (having) and the spaces where these actions can be better developed (interacting). Therefore, a broad spectrum of satisfiers arises on the search for their synergetic capacity to satisfy human needs simultaneously.

Moreover, the selected paths and bridges usually contain the tensions that are at stake between a negative version and a positive of the same kind of satisfier. The action is therefore in the overcoming and management of this tension. The paths that emerge in module 3 also operate as a minimum or a limit between which one can think of a development strategy for the group or the participating community.

2.1.3.1 Bridging negative and positive matrices

The original version of the HSDA (Max-Neef et al. 1986) does not deepen the bridging phase. It was Monica Guillén-Royo (2016) who has developed mainly in her methodological adaptation a reflection and practice on the action of bridging by either "generating a new matrix or a set of satisfiers with synergic characteristics that can bridge the negative and the utopian scenarios" (ibid.: 61). In this sense, bridging satisfiers are a broad oriented set of values, practices, and institutions to overcome a negative diagnosis, after which other actors and the community itself can co-define practical ways of implementing them. In our experience in most of the workshops bridging exercises, when possible, remained as a very broad, yet very clarifying level. In such a case results are value-oriented paths for action and required further analysis for more grounded results.

The action of collectively bridging responds to the questions of "how to overcome a negative satisfier?", "What resources, mechanisms, and practical tools do we have to design the future we want creatively?"

Bridging workshops are the most critical instance for planning and in our cases were not always possible (when gathering the group is out of the reach of the researcher). The extent to which the act of bridging, planning and action proposition is on the group or in the researchers` hands, depended on logistic and particular cases of each HSDA application.

In the case with high school teenagers, only the first module was completed. Researchers made further analysis. For each need, a group of negative satisfiers and a group of positive ones was selected and we identified a group of synergetic satisfiers and a set of possible actions that can be undertaken.

2.1.3.2 Prioritizing for action

Even though a set of synergetic satisfiers reduces the amount of data of the matrices and orientates towards desirable futures, decisions to prioritise action must be taken. Ideally through participative and democratic techniques such us voting, reaching consensus and discussion strengths and viabilities the group and/or the researcher team can define and propose to community a set or possible strategies. In one case study in a workshop with elderly bridging satisfiers ended up with 7 projects that dynamited the local community.

What happens next? As Guillén-Royo (2016: 41) points, approaching society as a system implies not only relying on specific policies but understanding, through direct involvement as researchers or practitioners, the supports that some processes need to be more effective in providing needs satisfaction. For transformation it is necessary to understand, and understanding is only possible through immersion. "You can only understand that of which you became a part, when the subject that searchers and observes become parts inseparably integrated with the object

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searched and observed" (Max-Neef 2005: 15).

TEENAGERS AT CORRAL COMUNE			
FUNDAMENTAL HUMAN NEED: UNDERSTANDING	**NEGATIVE SATISFIERS**	**SINERGETIC SATISFIERS**	**STRATEGIES FOR ENTREPRENEURAL LEARNING**
	• Laziness, lack of commitment • Conformity • Lateness, tardiness • Rigid and structured formal education (focused on content and measurements) • Bad internet connection • Lack of technical-productive training • Municipal library without use • Lack of educational institution in the commune	Empathy Understanding of the world from the territory ("we are coastal people") Motivation	• Development of habits and transversal attitudes for employability: punctuality, commitment, perseverance. • Exploration of non-formal learning instances (in organizations, clubs, etc.) • Rapprochement between youth and local government and Integrate civic education • Building alliances with local library and implementation of strategies to improve reading and learning skills (mobile library – storytelling for children). • Building alliances with teachers of Regional University for motivational talks and inspiring stories of effort
	POSITIVE SATISFIERS		
	• Learn from experiences • Incentives, rewards and benefits to those who strive and succeed • Parents' occupations and abilities • Self organization of time		

Table 2: Module 3 – Bridging workshop with high school teenagers of the region of Corral, Chile.

Close to other participatory approaches in development, such as Freire's Critical Pedagogy (1965) and Chambers` (1983) Participatory rural appraisal, HSDA relies on people`s active participation in every stage of the developmental process. Ideally it means that researchers should engage with communities and groups, not to prescribe solutions but to accompany the design, implementation and evaluation of strategies and programs.

When seen in the perspective of action for change, the matrix is not an end in itself but the beginning of a process of interaction and transformation. At the end of the workshop, participants ask themselves and question you as a researcher: "What now?" We know that elements that are preventing the realisation of our needs and we have managed to define those that synergically improve our quality of life. How do we continue? Many times, researchers cannot answer or take charge of this effect. In our experience, only a few projects can support the action research process. The elderly project engaged a deliberate and explicit attempt to contribute both to the generation of scientific knowledge and to the solution of concrete and immediate problems of the community. In this sense, the HSDA methodology as well as the foundations of participatory action research give centrality to people, the identification of common objectives, the decentralisation of the decision-making process, participation and consensus, elements often absent in the development strategies.

2.2 How to facilitate the HSDA as adapted by Spiering

The following adaptation of the original HSDA proposal was mainly developed within the German research project EnGeno on German Energy Cooperatives (Lautermann et al. 2017). In a first case study (2014 to 2016) we conducted HSDA workshops in three different energy cooperatives throughout Germany to better understand the cooperatives'

difficulties and for empowering the members to better meet their personal needs (Centgraf 2018). In a second case study (2016) we carried out a workshop with three other German energy cooperatives of one region and a transition town initiative to support them to elaborate common development strategies for an energy supply for their region based on renewable energies. In a third case study (2016) we collaborated with the German BMBF-project "Klima-Citoyen" (Schweizer-Ries et al. 2016) and conducted three HSDA-workshops in a southern German community to facilitate the decision process on forming a communal energy cooperative. Another case study was conducted 2016 in Paillaco, Chile in collaboration with the Institute of Economics of the University Austral de Chile (UACh) and the Community Innovators Lab at the Massachusetts Institute of Technology (MIT CoLab). Within the HSDA-workshop partners of the University and a Chilean technical school identified common strategies to establish a program for renewable energies at the technical school. In each of the eight workshops between ten to thirty people participated. In the following we present our adaptations and will discuss them concerning *technē* and *phrónêsis*. A detailed facilitation manual in three languages (English, German and Spanish) can be found in the Appendix.

2.2.1 Introduction and starting phase

2.2.1.1 Preparation phase

To start an HSDA process a common problem definition with relevant stakeholders is co-generated. To enter the field, gain preliminary information and to build trust before the workshops qualitative semi-structured interviews are conducted. The invitation of workshop participants as well as interviewees is discussed with the relevant stakeholders. The HSDA workshop is then prepared in collaboration with central contact persons.

2.2.1.2 Introduction of FHN

To start the HSDA workshop the facilitators introduce the project including the aim and all collaborators. They create transparency and provide all information about the preparation phase. The content-related part starts by introducing the differences between needs and satisfiers. To introduce the participants into the nine FHN one card per participant with one of the nine needs are delivered including a short description of the need and the three following questions: 1). How do you fulfil this need for yourself? 2). How is the fulfilment of this need affected in your life? 3). How do you support others to fulfil this need?

The participants are asked to think about these questions first on their own; and then share their insights in pairs of two after some five to ten minutes. After this the participants present their thoughts in the plenary and the facilitator puts one card per need on the floor. In a short open discussion participants are invited to share their insights and questions can be answered. Participants at that point get the possibility to add needs if they miss some.

Exercise "weighting of FHN": it is communicated very clearly in the workshop that the FHN do not have a hierarchy (as Max-Neef et al. 1991 state), nevertheless the participants are asked in a short exercise to bring the needs jointly and silently into an order – to see which needs they evaluate at the time being as the most important ones for them in the group. This exercise again aims on familiarizing the participants with the concept of needs and moreover may help them observe the change of the given weight to the needs throughout the conversation process.

Introduction of satisfiers: In a next step the existential categories of being, having, doing and interacting are introduced as described by Max-Neef et al. (1991). For each existential category (being, having, doing, interacting) a card is pinned on a board to build the matrix of needs and satisfiers.

2.2.2 Negative matrix

Before starting the joint matrix filling the facilitator tunes the group into the discussion, stating that for some this phase might be perceived as uncomfortable or difficult because the focus is only on negative aspects that impede

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the development of the group. Nevertheless the facilitator ask participants to engage and follow the now introduced rules for the further discussion. These include letting each other finish speaking, no discussions, no solution orientation and no blandishing of problems. The point 'no discussion' is important to prevent going into details and to maintain the flow of release. To start the process of filling in the matrix in a participatory manner the facilitator invites the participants to think about all the troubles, challenges and difficulties that they are facing in their development at that stage. The following critical questions are put on the wall/matrix to guide the discussion: "how are we / not?", "what do we have / not?", "what do we do / not?" "Where are we / not?"

The facilitator listens actively and supports the participants in filling in the matrix by asking which need(s) was/were impeded by this/these satisfier(s). All participants of the group are encouraged to share all the factors they see as obstructing the development of the group. Both this and the active role of the facilitator help to create a common atmosphere of sharing, listening and reflecting at the same time. This process lasts between 1.5 and 2.5 hours per group. After all the aspects are filled into the matrix the participants score the most impeding satisfiers per need. At the end of this process 9 to 15 of the most impeding satisfiers are identified and written on extra (red) cards. This marks the end of the first part of the workshop. It has been proved useful to do the negative matrix on the first day to release negative energy, like the method of Future Workshops (Jungk and Muellert, 1996) emphasises it.

2.2.3 Utopian matrix

At the beginning of the second day the facilitators present the results of the previous one and then introduce the procedure and rules for creating the Utopian Matrix. The matrix should now be filled with all the factors that would support the group in the best way possible. As all impeding satisfiers should had been discussed already the day before, it is not allowed to talk about doubts or impossibilities. The task is to dream of the best future the group could imagine, including impossible and unrealistic dreams. They should look out for satisfiers that meet their needs the best way possible. Analogous to the negative matrix the facilitators fill in all the mentioned factors. At the end of this exercise the participants score the most important satisfiers per need and 9 to 15 of the most important satisfiers are identified and written on extra (green) cards. This marks the end of the second part of the workshop.

Figure 4: Application of the Human Scale Development approach as adapted by Spiering

2.2.4 Strategy development: Bridging satisfiers, Eisenhower and SMART-analysis

In a next step the idea is to find bridging satisfiers that serve to overcome the negative aspects leading to the utopian vision. Therefore the participants identify head-topics allowing them to later find the bridging satisfiers. The most important negative factors (on red cards) and utopian factors (on green cards) are put together and the group clusters the factors finding four to five headlines describing their basic characteristics. These are the fundament for a new matrix which is created in a next step; the topic words building the x-axis and the axiological categories (being, having, doing, interacting) the y-axis. In group work, the participants find answers to the questions "How would we like to be?", "What would we like to have?", "What would we like to do?" and "Where would we like to interact?" to achieve the topics and present the results in the plenary.

To identify the most urgent and important bridging satisfiers the Eisenhower principle is introduced and implemented with the facilitation technique "Punktabfrage" ("point monitoring") (Möhwald, 2011). Starting with the most important and urgent satisfiers the group discusses a SMART procedure (specific, measurable, achievable, relevant and time bound) and decides what, by whom and until when the strategy can be implemented. Results of the discussion are written in form of a timetable and working plan as one main result of the workshops.

2.2.5 Evaluation and reflection

At the end of the workshop participants are asked to reflect on the workshop in a written evaluation and oral evaluation round in the plenary. Within the one-page evaluation sheet we ask questions concerning the methodology to further develop our adaptation and to gain insights how participants perceive the approach. Participants are asked to describe how comprehensive and helpful they perceived the different phases of the workshop (introduction into needs, introduction into satisfiers, negative matrix, utopian matrix, bridging satisfiers, SMART agreements) and to evaluate how helpful they perceived the workshop in general for their personal life and for the development of their group. In a final workshop report facilitators offer the participants an overview of the negative matrix, the utopian matrix and the bridging satisfiers that may guide their further development.

Eight to ten weeks after the workshop a post-workshop survey with semi-structured interviews are conducted with the same respondents as before the workshop. There we ask about the results of the workshop, the realisation of the working plan and comments concerning the methodology.

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3 Discussion and conclusions

3.1 Reflections on *technē*: Key differences and similarities between the two adaptations

With our presented applications we aim to provide detailed information on the facilitation processes and inspire other scholars and practitioners to apply them in their own settings and further develop them for their purposes. Following, we will outline main similarities and differences of the presented applications to reflect on the different "techniques" we applied to gain "how-to" practical *technē* knowledge.

One of the main differences of Barrera and Spiering's application is the matrix completion phase. Barrera does not conduct an explicit negative nor utopian or vision building phase as she assumes that not all the present factors are negative nor the future of a group a utopian construction. Therefore, she proposes adding negative satisfiers as well as positive satisfiers in a diagnosis both for the present and for an utopian vision of the group. Barrera finds the resulting conversation to be richer and more fluent. Instead of negative-positive/satisfiers the conversation focusses on the needs and satisfiers. Thus generating a big amount of textual data that can be analysed with content analysis methods. Spiering in contrast orientates her adaptation on the future-workshops (Zukunftswerkstätten) as devised by Jungk and Müller (1987), provoking a catharsis by explicitly focusing on negative factors. To emphasise that aim, the negative matrix has been introduced as "matrix of suffering" in former workshops. In the second phase, Spiering proposes to collect utopian factors as a form of backcasting, which frees positive energies and motivates participants to creatively think about desirable futures. What is missing here is a diagnosis of current potentials. Both authors believe that their applications could be gainfully combined. Furthermore, the modules presented by Barrera are very flexible and could easily be integrated with Spiering's workshop procedure. At the same time Spierings bridging phase and SMART analysis enables a goal oriented approach that could be inserted into Barreras adaptation within module 3.

	Differences	Similarities
Preparation, introduction and starting phase	**Barrera:** • Attuning participants in the identification group identity **Spiering:** • Pre-workshop survey with semi-structured interviews • Joint problem definition	• Intense preparation phase • Preliminary information through questionnaires • Informed consent • Exercises to support group formation
Matrix filling	**Barrera:** • Participants discuss satisfactors in sub-groups seated in front of posters per FHN. • Collecting negative and positive factors at the same time • Sub groups rotation for validation **Spiering:** • Filling in the matrix in the plenary according to presented rules • First fill in the negative matrix with all the destructive satisfiers (catalyst effect); identify most important destructive satisfiers • Fill in the utopian matrix after an exercise "journey to the future" (backcasting effect), identify most important utopian satisfiers	• Do not present the full matrix (as proposed by Max-Neef et al. 1991) • Conduct conversation through questions • Support participants in assigning the factors to the FHN • Active facilitation

Synthesis and bridging	**Barrera:** • Deep discussion on all mentioned satisfiers • Evaluation and re-structuring a significant explanation of relationships among negative and positive satisfiers.	• Build a synthesis matrix and find bridging satisfiers
	Spiering: • Extract headlines from the most important destructive and utopian satisfiers	
Planning	**Barrera:** • Finding possible pathways for overcoming the negative diagnosis of satisfaction • Emerging pathways span the whole range of possibilities (minimum to maximum) and operate as a field in which to elaborate on development strategies	• Discuss on paths for future development • Prioritise action
	Spiering: • Ranking of importance and urgency through Eisenhower-ranking of bridging satisfiers. • Developing an action plan based on SMART agreements	
Reflection	**Barrera:** • Generate instances and ways to return results to participants and convey them in a simple way to understand and validate the results. • Complementary questionnaires between the modules and after the matrix completion.	• Hand out workshop report with details on methods and results to the participants
	Spiering: • Evaluation sheet at the end of the workshop on the methodology • Oral evaluation • Post-workshop survey with interviews	

Table 3: Differences and similarities between the two presented adaptations

3.2 Reflections on *technē*: Key learnings on the adapted applications

In the following we will outline key learnings from three different moments (A-B-C): Before, between, and after the application of the workshop modules as presented by Barrera. These reflections and insights hold for the Spiering's application as well, although there are small differences that we will stress.

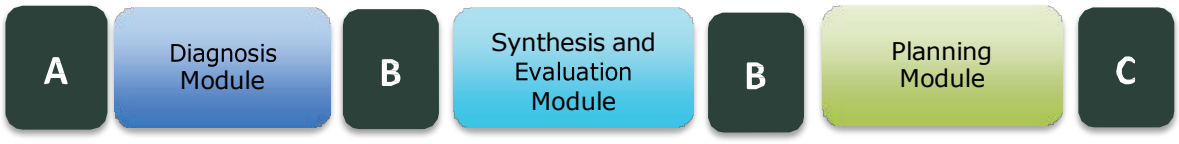

Figure 5: Overview of phases and key learnings of HSDA as presented by Barrera

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3.2.1 Moment A: Preliminary activities and considerations

Preliminary activities and logistic considerations are not explained in the original version (Max-Neef et al. 1986). But from our experience, there are some key points to take into consideration before applying a matrix workshop:

A1. Planning: Each module is an intensive workshop concerning logistic and facilitation. Detailed planning the logistic and interim results is very important. Researchers and organisers should take into consideration the kind of participants, the available time for the module/s and the goals to achieve with the workshop as well as the characteristics of the space where the activity is hold.

A2. Facilitation training: It is very important to train facilitators on the theoretical principles of FHN for HSDA. Within Spierings proposal facilitators do introduce the HSDA theory in parts, whereas in Barreras application even though there is no need to explain the theory to the participants of the workshops, it is essential that they obtain comprehensive knowledge on the theory. Facilitation skills have proven to be critical for the fluency of the conversation and the quality of the collected data: For instance, active listening, no imposed analysis, constant return of results for validation, control of group dynamic or mediation skills are very important.

A3. Registration and preliminary questionnaires: during the arrival and the registration is a good moment to ask participants to sign an informed consent and ask them to fill out preliminary questionnaires. In the context of scientific research and scholar activities, informed consent is essential, and participants should sign them before entering the workshop. Preliminary questionnaires give valuable research data to describe the group and triangulate results

A4. Logistic matters: Make sure all the necessary materials for the proper development of the tasks are available (from posters, pencils, post-it stickers to the provision of water and coffee for the participants).

3.2.2 Moment B: Between the modules

Within Barreras adaptations in some cases the workshop were conducted in a continuous two-day workshop where the first and the second module occurred consecutively. In other cases there were a few weeks between the first and the second module with the same group. In all the cases some activities need to be considered between the modules 1-2 and 2-3. Spiering applied her workshops all within one and a half days, therefore the following descriptions do not hold for her applications.

3.2.2.1 B1 Matrices visual cleaning (not changing)

Adhesive papers allow a quick registration of a group conversation. However, the result of a filled matrix turns "noisy" to re-read for selecting a synthetic version of it. Barrera, when possible, visually cleaned the matrix to enable participants to start the second module with clear wording to go on with the conversation.

3.2.2.2 B2 Apply complementary instruments:

Barrera proposes questionnaires and graphic scales to display needs satisfaction that can be implemented as additional tools to develop deeper insights once the matrices are filled in (Sharpe et al. 2016). The additional information has proven very important for data analysis and triangulation, especially if it is not possible to continue with the second or the third module. Still, it is important to first fill in the matrix and go through the discussion process before implementing such quantitative data query. Such instruments should reinforce the diagnosis and guide the bridging satisfiers' discussion and/or prioritise the action: for example, by starting to work on the less satisfied needs or searching for the strengths and synergetic satisfiers of the most satisfied needs.

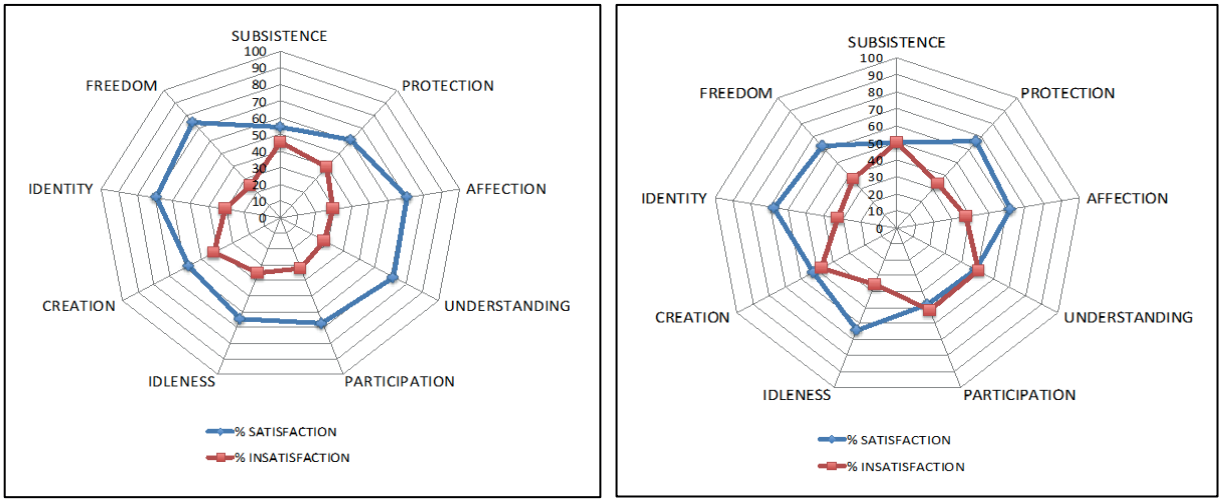

Figure 6: Examples of graphic scales as additional information concerning needs satisfaction. Left: graphic scale of needs satisfaction for the elderly in Valdivia. Right: Graphic scale of needs satisfaction for teenage students in Corral

3.2.2.3 B3 First reflection on process and results

When only one or two of the modules presented by Barrera can be completed, it is important to have a first discussion on results with the research team (researcher, facilitators and or students) as a didactical opportunity to reflect on the process, results, workshop dynamics and logistic.

3.2.3 Moment C: After ending the modules

C1. Report on methodology: Usually, after finishing the workshop researchers write reports on results and not so frequently report on methodology. The amount of data that emerge from the matrices determine whether researchers decide to focus on results or on the methodological process, leaving the later in second place, thus inhibiting other researchers or practitioners to have access to very useful information.

C2. Return result to participants. Even though engaging in action research processes is not always possible, it is important to generate instances and ways to return results to participants and convey them in a simple way to understand and validate the results. Therefore it is essential to provide the participants workshop reports with the workshop procedure and main results. Therefore in both proposals we do stress on the essential to provide the participants workshop reports with the workshop procedure and main results.

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3.3 Reflections on *phrónêsis*: HSDA applications as a value-driven research practice

As key learnings concerning *phrónêsis*, out of our intensive practical applications, we conclude that HSDA facilitates the identification of decisions based on value-driven reflections. HSDA empowers participants to articulate deprivations (by collecting negative factors) as well as potentials (by identifying present potentials (Barrera) and backcasting from utopian vision (Spiering)) as a basis for the co-creation of common development strategies. Participants report about the value of the reflection on the basis of FHN. They emphasised this to be a unique perspective and reported that the axiological categories opened their eyes to understand that very few of the strategies are dependent on economic resources and that they hold a lot of power themselves in satisfying their needs. This confirms what Du Toit (1998) discussed on seeing wealth in its manifold dimensions. Although at the beginnings of the workshop some participants need more time to get familiar with the concept of needs and satisfiers, they later benefit from the language that is easy to understand. It became apparent that the HSDA is very flexible not only because separate modules (Barrera 2017) can be applied all together or just one or two of them but also with regard to the fields it can be applied to. Additionally, HSDA can be easily combined and enriched with other approaches.

Most importantly HSDA provides a focus on values while re-thinking development concerns from ethical and aesthetical points of views (Cruz et al. 2010). People would ground their decisions on values and thereby human action would be political in the sense of choosing between different actions according to their values. Accordingly, recognising values in the discussion on community development furthers decisions on how to achieve good ends and desirable futures. HSDA provides a practical tool for enlarging "well-being and HD understanding by revealing how people establish their relations with their social and natural environments as sentient, self-reliant and self- reflective beings, continuously re-enacting their biological, social, cultural and spiritual needs in a systemic multidimensional way" (ibid.: 2029). With the reflection on synergic satisfiers that simultaneously fulfil several needs and are presented as sustainable strategies (Guillen-Royo 2015), HSDA represents an approach for production of phrónêsis. In 2005 Max-Neef elaborated further his theory on transdisciplinarity and named strong transdisciplinarity as tool and project alike where he draws values, ethics and philosophy as the umbrella that encompasses all other disciplines (Max-Neef 2005). He states: "transdisciplinarity, more than a new discipline or super-discipline is, actually, a different manner of seeing the world, more systemic and more holistic" (ibid.: 15). Sharpe et al. (2016) and Fazey et al. (2018) agree on the need for an extended recognition of research through practice and the expansion of technē and phrónêsis for sustainable development. We therefore see an urgent need in expanding the evaluations and reflections of such knowledge to develop quality measurements that are going beyond traditional epistemic knowledge quality measures. Discussing the Human Scale Development Approach as theory and applying it in different practical implementations contributes to show the value of reconciliation of epistemic, technē and phrónêsis to learn from facilitating change in practice.

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Appendix 1
Facilitation-Guidelines HSDA-Workshops

Salina Spiering, Helmholtz Centre for Environmental Research, Leipzig, Permoserstr. 15, 04318 Leipzig, Salina.spiering@ufz.de

1 Preparation

1.1 List of materials

- Data protection notice to be signed
- If necessary tape-/video-recording equipment
- Declaration of consent for tape/video-recording
- Name tags
- Catering
- List of participants (also for catering)
- 3 large pin boards
- 1 flipchart and prepared sheets
  - schedule for day 1 and day 2
  - rules for the negative and utopian matrix
  - Eisenhower-outline (see section 6.5.)
  - SMART-outline (see section 6.6)
  - Structure for the work plan (see section 6.6)
- Packing paper
- Facilitation kit
- Facilitation cards in various colours and sizes
- Sufficient one-sided sticky dots (red and green)
- Crepe tape
- Laminated sheets: 9 sheets (one per FHN, DIN A5), 4 sheets with axiological categories (being, having doing, interacting, DIN A4), 4 sheets with questions for: the negative matrix, the utopian matrix, the bridging matrix, DIN A4
- Needs cards with three questions for exercise (see section 8)
- Evaluation sheets
- Singing bowl/gong or something similar
- Wristwatch

1.2 Facilitation and distribution of roles

One person who preferably has professional experience in facilitation and mediation facilitates the workshop. A second person assists her or him or rather co-facilitates (attaches the matrix to the pin board, assists with filling in the matrix, collects the facilitation cards, checks the recorder, sees to it that the lists are completely filled in etc.).

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1.3 Detailed time schedule

Day 1

When?	What?	Who?	Material	Com-ments
16.30 – 17.00	Arrival, coffee and cake		Catering	
17.00 – 17.10	Welcome and short introduction into the project		List of participants; data protection notice	
17.10 – 17.20	Round of introduction by the participants; inquiry about the expectations		flipchart for collecting the expectations	
17.20 – 17.25	Presentation of the layout of the workshop		Show the schedule for the day on flipchart (prepared beforehand)	
17.25 – 17.35	Introduction of the HSDA-matrix incl. needs		Laminated needs sheets A5	
17.35 – 17.45	Needs cards (exercise)		Needs cards with three questions	
17.45 – 17.55	Silent weighting of needs (exercise)		Laminated needs sheets one by one	
17.55 – 18.05	Categories of strategies		Laminated strategy sheets / question sheets	
18.05 – 18.30	Phase 1: negative-matrix		Empty matrix on two pin boards, well functioning pens, rules for the neg. matrix on the flipchart	
18.30 – 18.50	Break			
18.50 – 19.30	Phase 1: negative-matrix		Matrix on pin board, pens, rules on flipchart	
19.30 – 19.45	Prioritising the strategies and collecting them in a new column		Sticky dots, red facilitation cards	
19.45 – 20.00	Concluding short round on day 1			

Day 2

When?	What?	Who?	Material	Com-ments
9.00 – 9.15	Arrival:			
9.15 – 9.30	Recapitulation of day 1			
9.30 – 10.30	Phase 2: utopian-matrix		Empty matrix on two pin boards	
10.30 – 10.50	Break			
10.50 – 12.15	Phase 2: positive-matrix		Matrix	
12.15 – 12.30	Prioritising the strategies and collecting them in a new column		Sticky dots, green facilitation cards	
12.30 – 13.30	Lunch break			
13.30 – 14.00	Building a bridge between the negative- und the positive-matrix; clustering		Facilitation cards presenting the negative (red) and positive (green) strategies developed; large white facilitation cards	
14.00 – 15.00	Small group work: filling the bridging matrix with synergetic strategies		Facilitation cards in as many colours as groups	
15.00 – 15.30	Presentation of the results of each group in the plenum, opening and filling in of a bridge matrix		New matrix	
15.30 – 16.30	Coffee break			
16.30 – 17.00	Eisenhower-weighting, enter into SMART agreements, development of a work plan		Table, Eisenhower-outline, SMART-outline, structure for the work plan	

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2 Welcome and introductory phase

2.1 Introduction of the project

Short presentation of the project: its objective, funding bodies, actors involved. Introduction of the moderator and co-moderator, if appropriate welcoming words of the host. Presenting and if necessary adjusting goals of the workshop that have be jointly developed beforehand. Achieve transparency regarding preceding Interviews, if there were any.

2.2 Round of introduction by the participants

Round of introduction: name, function within the group, expectations regarding the event and the question – what inspires me?

If appropriate: line-up in the room: For how long have you been a member of group …?

3 Introduction into the workshop

3.1 Organisational matters

The workshop lasts one and a half days altogether and is divided into three phases - presentation of the beforehand prepared schedule for day 1 at the flipchart:

Day 1

- Introduction and presentation
- Human Scale Development Approach
- Negative Matrix: what impedes our development?

Schedule: 5.00-8.00 pm, Breaks according to demand

Flipchart template for the schedule of day 1

Ensure confidentiality, ask for the signatures on the data protection notices – what is said in this room is confidential and remains "entre nous".

3.2 Content-related introduction

3.2.1 Introduction of the HSDA-Matrix

Background of the method:

The approach we will work with is called "Human Scale Development Approach" (HSDA) and was developed by the Chilean economist Manfred Max-Neef and his colleagues. Max-Neef was winner of the Alternative Nobel Price and worked on the topics sustainability and quality of life. The core of the method is a matrix of needs and strategies for meeting these needs. It was used by different groups especially in South America since the 1980s in order to identify deficiencies as well as prosperity / possibilities of a society or a group, or rather to find strategies for development on the basis of human needs – how do we want to live? What impedes us? And how do we achieve our goals?

In this workshop and within the framework of this research project we use and refine the matrix – at the end of the workshop each participant will get an evaluation sheet which we ask you to fill in for your own reflection and so that we can see what has been worthwhile, helpful etc. for you and how the format of the workshop can be further developed and adjusted.

Once again: the core of the method is a matrix of needs and strategies for meeting these needs. The first column contains a list of basic human needs collected by Max-Neef (based on the experiences he made during his work with various groups). In order to get acquainted with these needs we will now endeavour two exercises:

3.2.2 Needs cards (exercise)

In order to get acquainted with the needs used for the matrix, cards naming the nine needs (see section 8 "needs cards") are handed out; each person chooses one card and answers the following questions, for now silently only for him-/ herself:

- How do I meet this need for myself?
- What hinders me to meet this need?
- To what extent do I support others in meeting this need?

In a next step the participants enter a one-to-one discussion on the questions posed, the results of which are shortly summarised in the plenum. For each need that is presented,

the moderator puts a laminated DIN-A-4 sheet showing this need onto the floor. The moderator asks, whether there is another important need that should be added (and if so does so).

3.2.3 Silent weighting (exercise)

A short game gives a first glimpse on what the participants think to be currently the most relevant needs within the group.

The participants are asked to sort the nine need sheets laying on the ground according to their importance – which needs are more, which are less relevant for the group right now?

Rules of the game: it lasts for 3 minutes, everybody is allowed to replace each card again and again until time is up, it is not allowed to speak.

After 3 minutes time the facilitator gives a final signal, no further replacement is allowed. Right now there will be no elaborate evaluation of the resulting order. At the end of the workshop it may be referred to if helpful.

The facilitator pins the needs onto one of the pin boards top down in the order of the weighting.

3.2.4 Introduction into (existential) strategy categories

One basic idea of Max-Neef and his colleagues is the differentiation between needs (axiological categories) and strategies (existential categories) to meet these needs. It is usually suggested that e.g.to own a (specific) car is an important need. Following Max-Neef the car should be seen as a strategy, for example in order to meet the need for freedom. For other people, meeting the need for freedom might be achieved by going for a walk or by travelling or the like. This shows that in his theory all people share the same needs, independent of time, place or culture. What differs between individuals and depending on the availability of resources are the strategies chosen or envisaged to meet needs. At the same time Max-Neef also emphasises non-material strategies for meeting needs.

The facilitator introduces the existential categories that express the different manners in which needs can be met. He or she adds the laminated cards for the existential categories and the corresponding questions horizontally onto a pin board with the nine vertically listed needs and thus opens up the matrix of needs and existential categories:

Being: personal and collective characteristics. The column "being" collects adjectives describing all the features of persons or groups that give answers to the question: How are we/are we not? The need for participation cannot be met by every member of society, if other people are racist, indifferent, superior, arrogant, apathetic, etc. (optimal characteristics would be: adaptable, solidary, integrative, open-minded, respectful, etc.).

Having: refers to institutions, norms, mechanisms, legislation, material goods, and etc. and gives answers to the question: what do we have/not have? Given the example of the need for participation possible entries (nouns) in this column could be: discriminating education laws, repressive institutions, corruption, unemployment, etc. (optimal: human rights, responsibilities, (full) employment, etc.).

Doing: personal and collective activities (e.g. reading, learning, exchanging views, obtaining information, etc.). This column gives answers to the question: what do we do/not do? The column 'doing' refers to actions of people or groups; looking again at the need for participation possible verbs could be to discriminate, suppress, impose, restrict, etc. (optimal doing would be: to contribute, cooperate, participate, share, take a stand, make agreements, etc.).

Interacting: this column refers to the framework, to locations and the surroundings in time and place and gives answers to the question: where are we/not? E.g. the lack of public squares or parks as meeting places makes it difficult to meet the need for participation (optimal: cooperatives, associations, churches, families, communities, etc.).

At the beginning the boxes of the matrix are empty and shall be jointly filled during the following discussion.

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4 Negative-Matrix

	Being	Having	Doing	Interacting
Subsistence				
Protection				
Affection				
Understanding				
Participation				
Idleness				
Creation				
Identity				
Freedom				
	How are we/not?	What do we have/not?	What do we do/not?	Where do we interact/not?

Negative Matrix including FHN, existential categories and questions for orientation

4.1 Filling in the negative-matrix

The facilitator explains the next phase: it serves to collect all factors that currently obstruct the advancement of the group. He or she invites the participants to name all grievances and to use this phase in order to articulate any annoyances. At this point it is important that the facilitation prevents any discussion and personal charge, or rather reformulates possible accusations ("For you this is important, because your need for X is (not) met?"). The facilitator points out that this collection of the elements of the negative-matrix may be very strenuous and even frustrating but asks the participants for their cooperation, to take the plunge and to abide by the rules that are shortly talked through and shown on the flipchart:

Rules to fill in the negative matrix

- Do not interrupt other participants
- Collect strategies without discussing them
- Do not talk problems down
- Concentrate on negative factors

Flipchart template with rules for filling in the negative matrix

The facilitator asks the participants to take their time and to consider all challenges, problems and difficulties that the group currently faces.
In the plenum the participants start to name negative elements that impede the fulfilment of needs of group members and if possible to allocate them to the respective needs and existential categories on their own. The facilitator supports them regarding the allocation, if necessary he or she rephrases elements and helps to identify the need restricted by a certain strategy by asking clarifying questions (should a strategy impede the fulfilment of several needs, this strategy is written into several boxes). Both facilitators put down the aspects mentioned into the matrix without any fixed order or procedure just as they are called out, thus encouraging everybody to participate if a box should remain empty the facilitator points this out and asks whether there are any factors that would fit into this box.

4.2 Clustering the most important strategies for each need

When the collection of negative factors is exhausted, the one or two most important factors per need shall be identified. In order to do so it is recommendable to work with the sticky dots. Each participant may assign two red dots per need; in the end the one or two negative factors per need with most dots are written onto red facilitation cards and attached to the matrix.

4.3 Concluding 'flash' day 1

At the conclusion of day 1 the facilitator thanks all participants for their openness, confidence and perseverance and appreciates the results achieved thus far.
Short question to all participants:

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How are you right now, how do you feel?

What do you take along from here, what do you leave behind?

	Being	Having	Doing	Interacting	Most important negative factors
Subsistence	Xxxxx Xxxxx ●	Xxxxx ● ● ● Xxxxx ● xxxxxx	Xxxxx Xxxxx ●	Xxxxx ● Xxxxx ● xxxxxx	Xxxxx
Protection	Xxxxx ● Xxxxx ● ● ●	Xxxxx ● Xxxxx ●	Xxxxx ● Xxxxx ● ●	Xxxxx ● ● ● Xxxxx	Xxxxx
Affection	Xxxxx	xxxxx	Xxxxx	xxxxx	Xxxxx
Understanding	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Participation	xxxxx	Xxxxx ●	xxxxx	Xxxxx ● ●	Xxxxx
Idleness	Xxxxx	xxxxx	xxxxx	xxx	Xxxxx
Creation	xxxxx ●	xxxxx	Xxxxx ●	xxxxx	Xxxxx
Identity	xxx	xxxxx	xxxxx	xxxxx	Xxxxx
Freedom	Xxxxx ● ●	xxxxx	Xxxxx ●	xxxxx	Xxxxx
	How are we/not?	What do we have/not?	What do we do/not?	Where do we interact/not?	

Clustering the most important strategies for each need for the negative-matrix, summary on facilitation cards

5 Utopian Matrix

5.1 Introduction day 2

If there are new participants for day two, they are shortly introduced. Then the facilitator gives a brief summary of the results of the previous day and presents the schedule for day 2 written down on the flipchart:

Day 2

- Utopian Matrix: how do we want to live?
- Bridging strategies: how do we get there?
- SMART agreements: who does what when?
- Evaluation and finish

Schedule: 9.00 – 17.00, breaks: 12.30 – 13.30 and according to demand

Flipchart template for the schedule of day 2

5.2 Warm-up exercise for the utopian matrix: a journey to the future

As a warm-up for the utopian matrix the facilitator invites the participants to the exercise „journey to the future“. Whoever wants to, may shut their eyes and make themselves comfortable on their chairs: “Imagine it to be the year 2030. If you wish you may envisage yourself flying in a hot-air balloon or something similar over the landscape and you may dream of a future as you would feel it to be ideal; everybody is able to fulfil his or her needs: how are you and your fellow human beings (in your group/municipality/community/society…)? What do you see? How are the people? How do they behave? Which goods, services, norms and laws do they have? Under which framework do they live? Take another moment to look tranquilly at what is happening and how things are and then come back to the here and now. If you have not yet done so, bring back your attention into this room, here, today.”

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5.3 Filling in the utopian matrix

As a next step the participants are invited to name all factors that contribute to an optimal and ideal fulfilment of needs. It is explicitly welcome to dream of crazy, impossible things and to joyfully fantasise on ideas. The rules now are:

Rules for filling in the utopian matrix

- Everything is possible!
- Think big and the impossible
- Do not doubt
- Dream

Flipchart template: Rules for the filling in of the utopian matrix

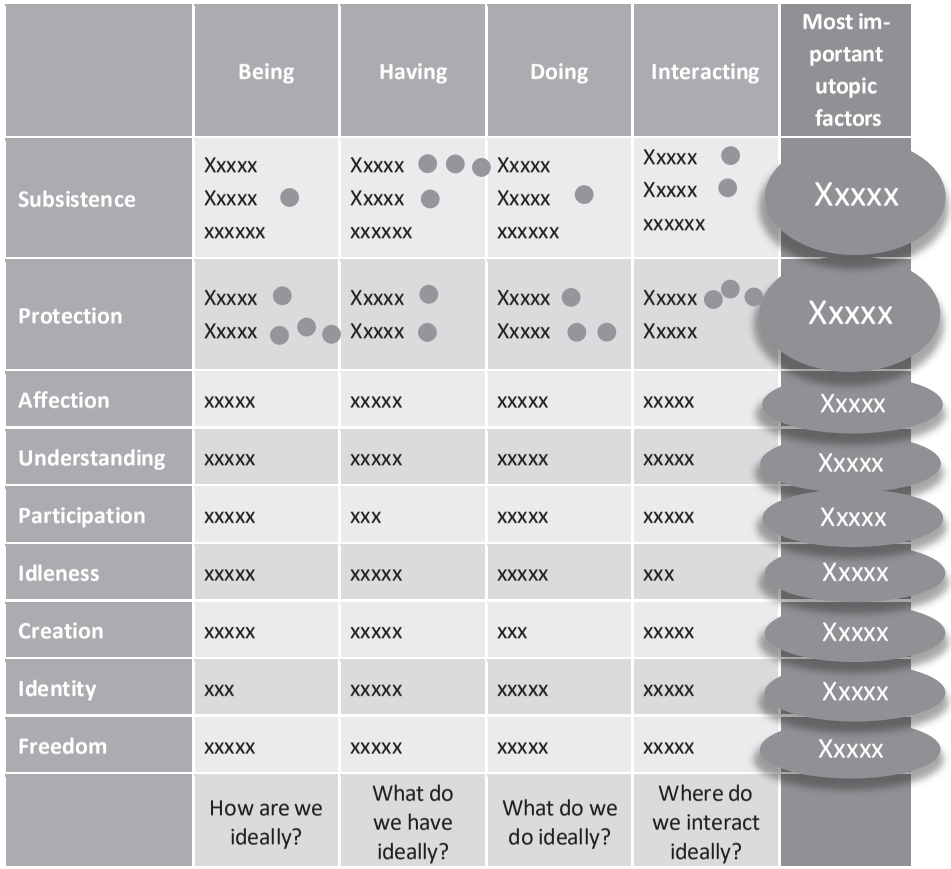
	Being	Having	Doing	Interacting
Subsistence				
Protection				
Affection				
Understanding				
Participation				
Idleness				
Creation				
Identity				
Freedom				
	How are we ideally?	What do we have ideally?	What do we do ideally?	Where do we interact ideally?

Utopian matrix including needs, existential categories and guiding questions

Just as when filling in the negative-matrix on day 1, the participants name all factors in the plenum that fulfil the needs ideally. These guiding questions help to direct the discussion: how are we optimally, what do we optimally have, what do we optimally do and where (under which framework) are we optimally? The facilitators support the allocation to the boxes of the matrix and write down the strategies mentioned.

5.4 Clustering the most important strategies for each need

When the collection of utopian factors is exhausted, the one or two most important factors per need shall be identified. Each participant may assign two dots per need; in the end the one or two utopian factors per need with most dots are written onto green facilitation cards and attached to the matrix.



Clustering the most important strategies for each need for the utopian matrix, summary on facilitation cards

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6 Strategy development

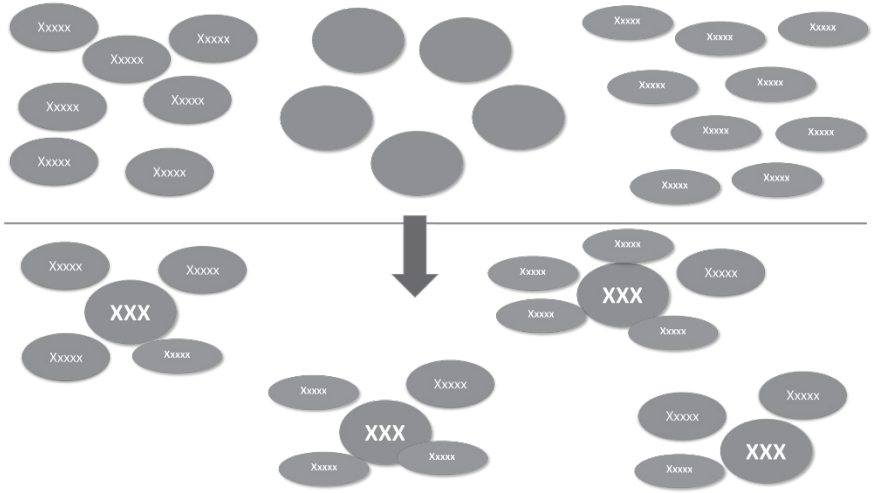
6.1 Building a bridge between the negative- and the utopian matrix

At this stage of the workshop those concepts and categories that evolve from the most important strategies of the utopian and the negative-matrix are identified. Thus we will answer the question: what is this all about?

6.2 Clustering and finding head-topics

In order to achieve this the most important utopian factors on the green facilitation cards (that describe how the group/society should optimally be in order to meet the needs of its members optimally) and the most important negative factors on the red facilitation cards (challenges that should be met by the group/society) are attached on opposite sides of a pin board. The participants are asked to identify common features and essences of the factors and to suggest (max 5!) comprehensive terms for groups of them.

These comprehensive terms with the factors assigned to them are attached to the pin board as clusters.



Finding head-topics of the most important negative- and utopian factors

6.3 Matrix made of head topics and bridging strategies

Now the facilitator replaces the first column of the matrix that until now held the 9 needs defined by May-Neef with the head topics (max 5), the existential categories in the uppermost line remain the same, the boxes will hold bridging strategies.

	Being	Having	Doing	Interacting
Xxxxx				
Xxxxx				
Xxxxx				
Xxxxx				
Xxxxx				
	How do we want to be?	What do we want to have?	What do we want to do?	Where do we want to interact?

Table with bridging strategies

6.4 Elaborating bridging strategies in small groups

The participants now continue by working in groups. For each of the head topics a group is formed and each participant joins the group according to the topic he or she wants to work on. Beginning with the first utopian satisfier the group members ask: How do we want to be, so that more of … is part of our life as a group/society? The answer to the question is a possible entry for the first box in the line of this group in the matrix. The same question is posed for all the other factors assigned to this head topic and after that strategies for the columns having, doing and interacting are found.

At this point of the workshop it may be helpful to introduce a differentiation Max-Neef offers regarding strategies:

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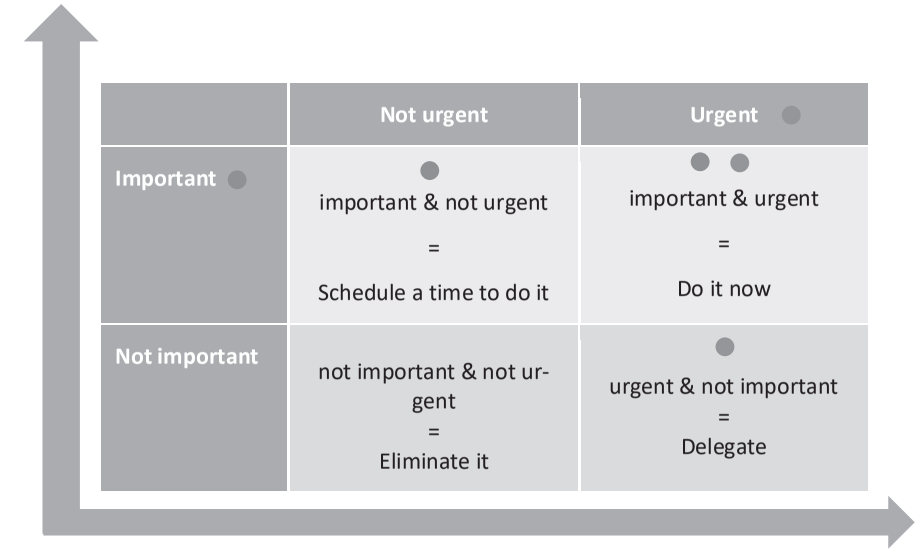
- Violators or destructive strategies that make the fulfilment of needs impossible
- Pseudo-satisfiers that only pretend to fulfil needs
- Inhibiting satisfiers that that over fulfil needs and thus prevent the fulfilment of other needs
- Singular satisfiers that only fulfil one need
- Synergetic satisfiers that stimulate the fulfilment of several needs

The goal is to identify elements/measures that can be actually implemented and that belong to the category of synergetic strategies. The results of the teamwork of the small groups are presented in the plenum and the bridging-matrix is filled in with the synergetic strategies that were found.

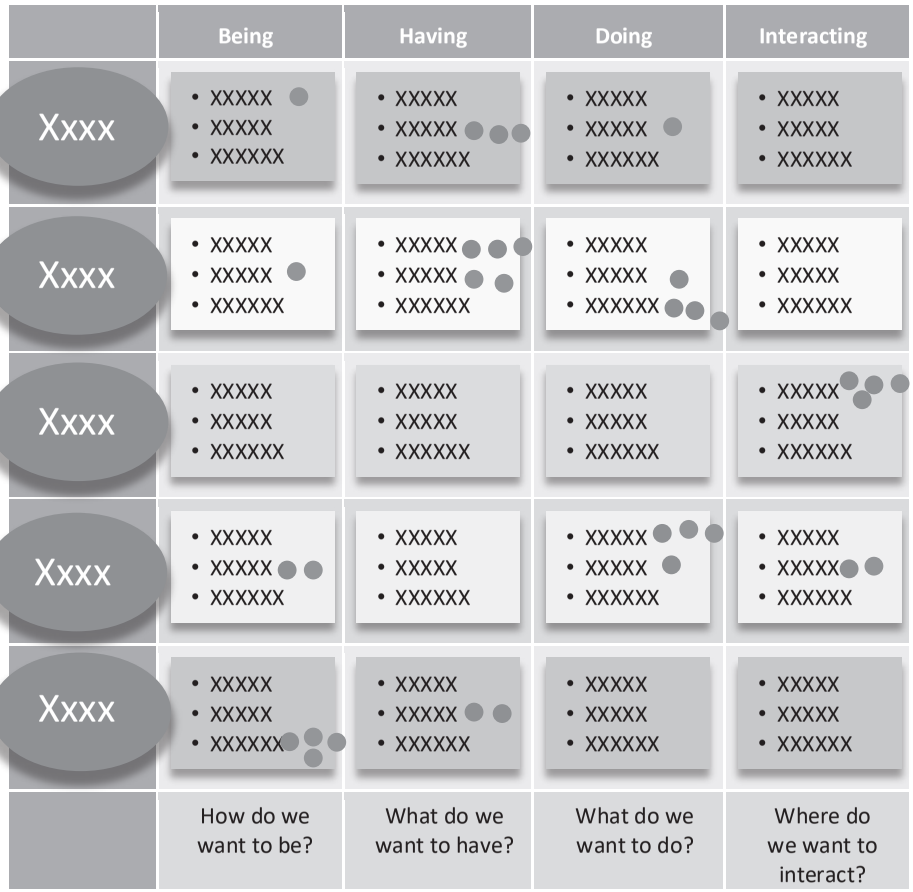
.

6.5 Eisenhower-principle: prioritising the bridging-satisfiers

The moderator introduces the Eisenhower-principle for the priorisation of tasks. Each participant is asked to allocate two dots per line (that is per head topic), red for „urgent“and green for „important“, thus weighting the strategies found in the small-group works.



Eisenhower-principle



Bridging strategies elaborated in small-group works, weighted using the Eisenhower-principle (green=important, red=urgent)

When the most important and most urgent „bridging“-strategies have been selected, the plenary session discusses whether these are actually “synergetic” (that means that these satisfiers fulfil more than one need, which needs these are and in which way they are met) and whether the group/society is able to implement the strategies by themselves or which partners/supporters are needed. The most important and most urgent bridging strategies are translated then into a work-plan, discussing the satisfiers both important and urgent first, then the urgent ones and then the important ones.

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6.6 SMART agreements

In order to develop a specific work-plan and to actually implement the strategies, persons are determined who are in charge for their implementation. Therefore a SMART-analysis is undertaken:

SMART agreements	
Specific	What is the goal?
Measurable	How can the goal be measured?
Achieveable	Is it achievable for all participants?
Relevant	Is it relevant?
Time bound	Until when the goal should be reached?

Characteristics of SMART agreements

What has to be done?	By whom?	Until when?	Comments?

Working plan with a specific distribution of tasks on the basis of the SMART-characteristics

7 Evaluation and reflection

7.1 Evaluation of the Workshops

Finally the moderators hand out an evaluation sheet and ask the participants to fill it in right away.

7.2 Concluding round and farewell

At the end of the workshop the participants are asked to answer these questions:

How are you?
What do you take along from this workshop?
What did you like, what would you have gladly done without?
Which suggestions do you have?

The facilitator gives an outlook on when the documentation of the workshop and possibly other documents will be available and points out where further information on the project can be found. He or she offers to answer any further questions and thanks everybody for their participation.
Farewell and end of the workshop.

7.3 Workshop report

As a follow-up the facilitators compile a workshop report, recording all the relevant intermediate steps and where appropriate including photos. This workshop-report will be made available to all participants (template see annex).

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8 Needs cards

SUBSISTENCE

The need to remain alive

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

IDENTITY

The need for being oneself

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

PROTECTION

The need to reduce to be exposed to risks

4. How do I meet this need for myself?
5. What hinders me to meet this need?
6. To what extent do I support others in meeting this need?

CREATION

The need to express oneself by crafting

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

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AFECTION

The need to give and receive love

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

PARTICIPATION

The need to be an active part of society

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

UNDERSTANDING

The need to comprehend

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

IDLENESS

The need for free time without paid labour

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

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FREEDOM

The need to be responsible for one's own actions

1. How do I meet this need for myself?
2. What hinders me to meet this need?
3. To what extent do I support others in meeting this need?

Appendix 2
Guía de Moderacion: Talleres del DEH

Salina Spiering
Helmholtz-Zentrum für Umweltforschung, Leipzig, Permoserstr. 15, 04318 Leipzig,
Departamento de Sciencias Politicas Ambientales, Salina.spiering@ufz.de

1 Preparación

1.1 Lista de Materiales

- Consentimiento informado para firmar
- Grabador/Videocámara
- Formulario de consentimiento para grabar
- Etiquetas con nombres
- Organizar catering
- Lista de participantes
- Tres paneles de presentación
- 1 rotafolio
- Maleta de facilitación
- Puntos adhesivos (en color rojo y verde)
- Banda de crepé
- Necesidades, categorías y preguntas en papel A5 impreso y laminado
- Tarjetas de necesidades con tres preguntas (Annex) impreso
- Fichas de evaluación
- Cuenco/gong/timbre
- Reloj/pulsera

1.2 Moderación y distribución de roles

Una persona actúa como facilitadora, tiene experiencias en moderación y preferentemente en mediación. Una segunda persona asiste como co-facilitadora (colocar la matriz, apoye en rellenar la matriz, recoge las tarjetas de moderación, comprueba el grabador etc.).

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1.3 Planificación detallada

Día 1

Cuando	Que	Quien	Materiales	Comentarios
16.30 – 17.00	Llegada con café y pasteles		Catering	
17.00 – 17.10	Bienvenida y presentación del facilitador		Lista de participantes; aviso de privacidad	
17.10 – 17.20	Presentación de los participantes y consulta de expectativas		Recoger expectativas en el rotafolio	
17.20 – 17.25	Presentación planificación del taller		Planificación en el rotafolio	
17.25 – 17.35	Introducción al "Desarrollo a Escala Humana"; y las necesidades humanas fundamentales		Un papel en A5 para cada necesidad impreso y laminado	
17.35 – 17.45	Ejercicio con tarjetas con necesidades y tres preguntas		tarjetas con necesidades y 3 preguntas (una necesidad para cada participante	
17.45 – 17.55	Ejercicio: Ponderación de las necesidades (priorización por orden de importancia). Pesar-las (orden de importancia)		Un papel en A5 para cada necesidad imprimido y laminado	
17.55 – 18.05	Estrategias existenciales		Un papel en A5 para cada estrategia existencial	
18.05 – 18.30	Primer Fase: Factores (satisfactores) que impiden el desarrollo "Matriz negativa"		Matriz pegada en dos paneles de presentación; reglas del juego	
18.30 – 18.50	Pausa			
18.50 – 19.30	Continuación primer fase: Factores que impiden el desarollo "Matriz negativa"		Matriz pegada en dos paneles de presentación, reglas del juego	
19.30 – 19.45	Pesar las estrategias mas importantes y recolección en nueva columna		Puntos adhesivos, tarjetas de moderación en rojo	
19.45 – 20.00	¿Como estas ahora?			

Día 2

Cuando	Que	Quien	Materiales	Comentarios
9.00 – 9.15	Bienvenida			
9.15 – 9.30	Recapitulación del día anterior			
9.30 – 10.30	Segunda Fase: Matriz utópica		Matriz pegada en dos paneles de presentación, reglas del juego	
10.30 – 10.50	Pausa			
10.50 – 12.15	Segunda Fase: Matriz utópica		Matriz pegada en dos paneles de presentación, reglas del juego	
12.15 – 12.30	Pesar las estrategias mas importantes y recolección en nueva columna		puntos adhesivos, tarjetas de moderación en verde	
12.30 – 13.30	Almuerzo			
13.30 – 14.00	Satisfactores puentes, buscar temas comunes		Factores negativos (tarjetas rojas) y factores positivos (tarjetas verdes); tarjetas de moderación blancas y grandes	
14.00 – 15.00	Trabajo en grupos pequeños – matriz puente		Tarjetas de moderación en la cantidad según del número de grupos	
15.00 – 15.30	Presentación de los resultados en la plenaria, matriz puente		Preguntas de la matriz puente, tarjetas con necesidades	
15.30 – 16.30	Pausa			
16.30 – 17.00	Jerarquización según de Eisenhower, SMART acuerdos/desarrollar un plan de trabajo		Taba de Eisenhower, tabla SMART y estructura del plan de trabajo	

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2 Bienvenida y fase inicial

2.1 Introducción al proyecto

Introducción al proyecto y de las fuentes de financiamiento, actores involucrados y metas del proyecto. Presentación de la facilitadora y co-facilitadora. Cuando proceda palabras de bienvenida del anfitrión.

Presentar las metas del taller que se estaban desarrollando en previas fases y si procede adaptar los objetivos. Informar a los participantes sobre la realización previa de entrevistas semi-estructuradas realizadas a algunos participantes como etapa previa al taller.

2.2 Presentación de los participantes

Se invita a los participantes a presentarse frente al grupo, indicando su nombre, la posición en el grupo y su motivación/sus expectativas en la participación del taller. Esta presentación permite al facilitador conocer la información con la que los participantes fueron convocados y moderar las expectativas sobre el taller.

3 Introducción al taller

3.1 Asuntos organizativos

Se explican los objetivos del taller resaltando como la metodología puede ser útil para que los grupos puedan identificar problemas de forma colectiva, construir una visión conjunta (soñar) y elaborar un plan de trabajo para conseguirla.

Se anticipa la planificación para logar los objetivos. El taller durará 1 día y medio dividido en tres fases. En la primera fase se levanta la matriz negativa durante la tarde del primer dia. En la mañana siguiente, se repite el ejercicio construyendo la matriz utópica. Una tercera fase en la tarde del segundo día, se elabora un plan de acción o plan de trabajo.

Se asegura a los participantes la confidencialidad de las opiniones que expresen. Se informa sobre la grabación del taller.

Se abre un espacio para preguntar y evacuar dudas en los participantes.

Día 1

- Bienvenida y presentación
- Desarollo a Escala Humana
- Matriz negativa: ¿Qué factores impeden nuestro desarollo?

Tiempos: 17.00 – 20.00, Pausas según necesidad

Ejemplo de un rotafolio con programa operativo día 1

3.2 Introducción del contenido

3.2.1 Presentación de la teoría del DEH

A continuación se presentan los principios teóricos del DEH y su metodología. Entre los principios del DEH propuestos del Chileno Manfred Max-Neef y sus colaboradores se destacan:

- El desarrollo no se refiere a los objetos sino a las personas
- La calidad de vida depende de la adecuada satisfacción de las Necesidades
- Todas las personas compartimos un conjunto de necesidades a las que llama Necesidades Humanas Fundamentales. Estas necesidades son universales y validas para todas las personas en todos los tiempos y culturas, independientemente de su condición y posición socioeconómica
- Estas 9 necesidades no tienen jerarquía, (como en la propuesta de Maslow)
- La metodología se basa en una matriz que busca identificar las vulnerabilidades y las potencialidades
- Las 9 necesidades se presentan en una matriz y para llenarla llevamos a cabo un taller y trabajar en un grupo y discutir juntos ¿Cómo queremos vivir?", ¿Qué nos impide? ¿Cómo logramos los objetivos?

En la columna vertical de la matriz están las 9 necesidades que Max-Neef recopilo a base de sus experiencias en talleres con diferentes grupos. Para familiarizarse con las necesidades el grupo realiza dos ejercicios.

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3.2.2 Ejercicio con tarjetas con las Necesidades Humanas fundamentales

Para familiarizarse con las 9 necesidades propuestas por el DEH se disponen de tarjetas con las necesidades (en el anexo). Cada persona se toma una tarjeta con una necesidad. Cada una de ellas tiene una descripción de su significado y se realizan tres preguntas:

- ¿Cómo cumplo esta necesidad?
- ¿Qué es lo que me impide satisfacer esta necesidad?
- ¿En qué medida apoyo a otros para satisfacer esta necesidad?

Los participantes leen las cartas, toman 5 minutos para pensar sobre las preguntas y luego comentan sus opiniones con su vecino (sentado a su lado). Después los resultados se presentan en la plenaria. Conforme se van presentando cada necesidad, la facilitadora pone un papel impreso y laminado con la necesidad respectiva en suelo. Cuando cada de las nueve necesidades esta puesta la facilitadora pregunta sí los participantes quieren añadir una otra necesidad que les falta.

3.2.3 Ejercicio ponderación silenciosa

Se solicita que los participantes pongan las necesidades en orden de 1 a 9 ubicando primero las necesidades que ellos consideran más importantes seguidas por las que consideran menos importantes.

La única regla de este ejercicio es mover las cartas en silencio . Se dan tres minutos para esta priorización, hasta que suena un timbre o campana. No se hace una análisis en ese momento, sino al final del taller se puede referenciar al ejercicio.

La facilitadora cuelga las necesidades en el orden de la ponderación, una bajo la otra en una pizarra o en la pared.

3.2.4 Categorías existenciales para definir satisfactores

A continuación se explican las categorías existenciales para definir satisfactores. Desde lo indicado en la teoría y apoyado por ejemplos entendibles para el tipo de participante. Se introducen las categorías del ser, tener, hacer y estar:

Una de las ideas más importantes en la teoría de Max-Neef es la distinción entre necesidades y satisfactores para cumplir las necesidades. En general las personas suelen considerar que por ejemplo poseer un coche lujoso de una determinada marca, es una necesidad importante. En el caso de Max-Neef el coche puede ser entendido como un seduo-satisfactor para satisfacer la necesidad identidad y libertad. Otras personas a su vez cumplen la necesidad de libertad a través de pasear o viajar. Significa que en su teoría las personas comparten las mismas necesidades fundamentales independiente del tiempo y la cultura. Lo que es individual y dependiente de los recursos son las satisfactores para cumplir las necesidades. Al mismo tiempo Max-Neef destaca que no solamente hay satisfactores materiales sino también inmateriales:

Ser: La columna del SER registra atributos personales o colectivos, y da una respuesta a la pregunta ¿Cómo somos?". **Ejemplo:** La necesidad de participación no se puede satisfacer cuando las personas son racistas, arrogantes o apáticos. Por otro lado la necesidad se potencia cuando al contrario las personas son solidarias, integrativas y abiertas.

Tener: La columna del TENER, registra instituciones, normas, mecanismos, herramientas (no en sentido material), leyes , etc. Y que pueden ser expresados en una o más palabras. Da una respuesta a la pregunta ¿Qué tenemos?" **Ejemplo:** La necesidad de participación podría estar impedida por corrupción, desempleo. Por otro lado la comunidad pueden tener respeto por los derechos humanos, pleno empleo.

Hacer: La columna del HACER registra acciones, personales o colectivas que pueden ser expresadas como verbos. y da una respuesta a la pregunta: ¿Qué hacemos? **Ejemplo:** La necesidad de Participación se inhibe al discriminar, suprimir o censurar y se potencia y satisface al cooperar, compartir leer, aprender, intercambiar etc.

Estar: La columna del ESTAR registra espacios y ambientes físico o no. Y da una respuesta a la pregunta: ¿Dónde estamos? **Ejemplo:** La necesidad de participación se obstaculiza con la falta de espacios públicos o parques y se potencia positivamente cuando las personas se encuentran en espacios de interacción como organizaciones, iglesias, familias, comunidades.

La facilitadora presenta las categorías existenciales, que expresan las formas de cumplir necesidades; ella cuelga en la pared las páginas laminadas con cada categoría una al lado de la otra (horizontalmente) y las preguntas asociadas. De esta forma se construye la matriz completa para ser posteriormente rellenada.

Se explica que los siguientes ejercicios de construcción de las matrices implican llenar los casilleros de la matriz con satisfactores, respondiendo las preguntas para cada una de las columnas. Se da inicio a la fase 1.

4 Matriz negativa

	Ser	Tener	Hacer	Estar
Subsistencia				
Protección				
Afecto				
Entendimiento				
Participación				
Ocio				
Creación				
Identidad				
Libertad				
	¿Cómo somos?	¿Qué tenemos?	¿Qué hacemos?	¿Dónde estamos?

Matriz negativa con necesidades, categorías existenciales y preguntas de orientación

4.1 Llenar la matriz negativa

La facilitadora introduce la próxima fase: el objetivo es colocar todos los factores que impiden el desarrollo del grupo. Ella anima a los participantes a aprovechar esa fase para formular problemas y molestias. La facilitadora no permite que se generen discusiones ni ataques personales ("¿Para usted eso es importante porque usted quiere satisfacer su necesidad de X?"). La facilitadora indica que este fase a veces es percibida como estresante o frustrante; aún así anima a los participantes a involucrarse y seguir las reglas que están puestas en el rotafolio.

Se realiza la siguiente pregunta a todo el grupo: ¿Cuáles son los factores (satisfactores) que impiden el desarrollo del grupo?, ¿cuáles son los factores (satisfactores) que causan ese sufrimiento?

Antes de la recolección de satisfactores, la facilitadora invita a los participantes a reflexionar sobre todos aspectos que son problemáticos y difíciles en el grupo. En sesión plenaria los participantes levantan sus manos, nombran los elementos que impiden el desarrollo del grupo y asignan en cual casilla el factor puede ser puesto. La facilitadora y co-facilitadora están paradas frente a la matriz, apoyan en la clasificación y van anotando lo que los participantes dicen. Ellas apoyan el proceso preguntando sobre cuáles necesidades los participante consideran que están siendo insatisfechas a causa de lo contado. La matriz se va rellenando con las opiniones de los participantes. Si una casilla queda vacía, la facilitadora pregunta si hay más factores que puedan ubicarse en ese casillero. Esta fase termina cuando los participantes han llenado todos los casilleros de la matriz con satisfactores.

Reglas de llenar la matriz negativa

- No interrumpir a las personas mientras hablan
- Todas las opiniones son válidas y quedan registradas en la matriz
- Recolectar sin discutir los factores
- No minimizar las problemas

Ejemplo de un rotafolio con reglas para llenar la matriz negativa

4.2 Selección de satisfactores (estrategias) más importantes por necesidad

Una vez que se llenaron los casilleros de la matriz, cada participante recibe papeles adhesivos con forma de puntos; (cada participante recibe dos puntos por necesidad) y se les solicita marquen aquellos factores (satisfactores) más importantes para cada necesidad.

En una cartulina aparte de un color (Rojo) los facilitadores del taller escriben aquellos factores que el grupo definió como más importantes.

Hacia el final de esta fase y de la primera media jornada del taller se completa la matriz negativa y se cuenta con una priorización realizada por el mismo grupo.

	Ser	Tener	Hacer	Estar	Factores negativos mas importantes
Subsis-tencia	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx
Protección	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx
Afecto	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Entendi-miento	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Participación	xxxxx	xxx	xxxxx	xxxxx	Xxxxx
Ocio	xxxxx	xxxxx	xxxxx	xxx	Xxxxx
Creación	xxxxx	xxxxx	xxx	xxxxx	Xxxxx
Identidad	xxx	xxxxx	xxxxx	xxxxx	Xxxxx
Libertad	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
	¿Cómo somos?	¿Qué tenemos?	¿Qué hacemos?	¿Dónde estamos?	

Selección de satisfactores (estrategias) mas importantes por necesidad en la matriz negativa y resumen en tarjetas de moderación

4.3 Cierre día 1

Para terminar la jornada la facilitadora agradece a los participantes por su sinceridad, confianza y resistencia y valora lo trabajado. Ella pregunta a los participantes las siguientes preguntas: ¿Como está ahora? ¿Que lleva usted y que es que usted quiere dejar aquí?

5 Matriz utópica

5.1 Introducción día 2

Al principio del segundo día se presentan a los nuevos participantes (sí los hubiese) y la facilitadora hace un resumen del día anterior. A continuación se presenta la planificación del segundo día del taller en el rotafolio:

Día 2

- Matriz utópica: ¿Cómo queremos desarollarnos?
- Estrategías puentes: ¿Como llegamos hasta ahí?
- Acuerdos SMART y plan de trabajo
- Evaluación y cierre

Tiempos: 09.00 – 17.00, Pausas: 12.30-13.30 y según necesidad

Ejemplo de un rotafolio con programa operativo día 2

5.2 Ejercicio para familiarizarse con la matriz utópica: viaje al futuro

La facilitadora invita a los participantes a cerrar los ojos sí quieren y viajar a un futuro utópico en el año 2030 en que todos habitantes de la comunidad (grupo y entorno) pueden satisfacer sus necesidades. “Se pueden imaginar volando en un avíon, o unglobo aerostático o algo diferente y pueden observar cómo está la gente: ¿Cómo está usted y los demás seres humanos (en su grupo/comunidad)? ¿Qué es lo que puede observar? ¿Como se comporta la gente? ¿Cuáles recursos, normas y reglas tienen? ¿Cómo son los entornos? ¿En cuáles entornos viven? La facilitadora indica a los participantes que se tomen unos minutos más para observar este futuro tan lindo y valioso. Luego indica que si ya pudieron visualizarlo, regresen al “aquí y ahora.”

5.3 Llenar la matriz utópica

Ahora los participantes ya conocen los principios de la teoría y las necesidades. En esta ocasión la consigna es: Ahora es tiempo de soñar!

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La facilitadora les solicita que responda las preguntas de la matriz buscando los factores óptimos para la satisfacción de las necesidades humanas fundamentales en el grupo/la comunidad.

Reglas para llenar la matrix utópica

- Sueña!
- Todo es posible
- Piensa en grande
- No dudes!

Ejemplo de un rotafolio con reglas para llenar la matriz utópica

	Ser	Tener	Hacer	Estar
Subsistencia				
Protección				
Afecto				
Entendimiento				
Participación				
Ocio				
Creación				
Identidad				
Libertad				
	¿Cómo seríamos en una situación óptima?	¿Qué tendríamos en una situación óptima?	¿Qué haríamos en una situación óptima?	¿Dónde estaríamos en una situación óptima?

Matriz utópica con necesidades, categorías existenciales y preguntas de orientación

5.4 Selección de satisfactores (estrategias) mas importantes por necesidad

	Ser	Tener	Hacer	Estar	Factores utópicos mas importantes
Subsistencia	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx
Protección	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx
Afecto	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Entendimiento	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Participación	xxxxx	xxx	xxxxx	xxxxx	Xxxxx
Ocio	xxxxx	xxxxx	xxxxx	xxx	Xxxxx
Creación	xxxxx	xxxxx	xxx	xxxxx	Xxxxx
Identidad	xxx	xxxxx	xxxxx	xxxxx	Xxxxx
Libertad	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
	¿Cómo seríamos en una situación óptima?	¿Qué tendríamos en una situación óptima?	¿Qué haríamos en una situación óptima?	¿Dónde estaríamos en una situación óptima?	

Selección de satisfactores (estrategias) mas importantes por necesidad en la matriz utópica y resumen en tarjetas de moderación

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Una vez que se llenaron los casilleros de la matriz, cada participante recibe papeles adhesivos con forma de puntos; (cada participante recibe dos puntos por necesidad) y se les solicita marquen aquellos factores (satisfactores) más importantes para cada necesidad.

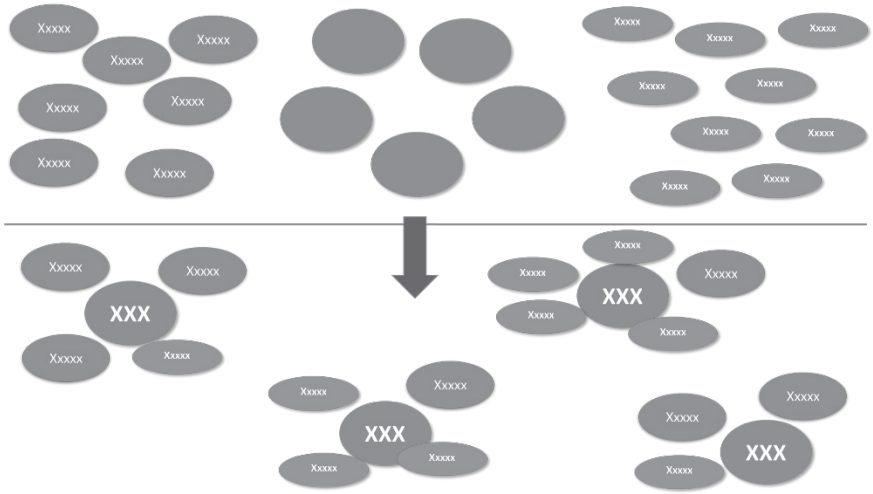
En cartulina aparte de un color (verde) los facilitadores del taller escriben aquellos factores que el grupo definió como más importantes.

Hacia el final de esta fase se completa la matriz utópica y se cuenta con una priorización realizada por el mismo grupo.

6 Satisfactores puente

6.1 Buscar temas comunes entre factores negativos y utópicos

En la siguiente media jornada del taller, el grupo guiado por la facilitadora busca identificar temas comunes en las síntesis de las matrices y reducirlos a un número acotado para continuar el trabajo.



Temas comunes de las factores mas importantes de la matriz negativa y la utópica

Se presentan en la pared la cartulina roja (con los factores negativos priorizados en la fase 1) y la cartulina verde (con los factores utópicos priorizados en la fase 2).

Se solicita a los participantes buscar temas en común que sean inclusivos de los factores identificados (títulos de encabezados). Se identifican en la plenaria un máximo de 5 grandes temas para continuar el trabajo

6.2 Matriz con temas comunes y satisfactores puentes

Las facilitadoras construyen una nueva matriz donde las necesidades axiológicas (filas) son reemplazadas por los temas seleccionados (ver siguiente tabla).

	Ser	Tener	Hacer	Estar
Xxxxx				
Xxxxx				
Xxxxx				
Xxxxx				
Xxxxx				
	¿Cómo queremos ser?	¿Qué queremos tener?	¿Qué queremos hacer?	¿Dónde queremos estar?

Tabla con satisfactores puentes

6.3 Matriz puente - trabajo en grupos pequeños

Los participantes eligen un tema común en que quieren colaborar y forman grupos para llenar esta tercer matriz (dependiente del numero de temas comunes). A cada grupo se le asignan 1 o 2 de los temas identificados. En aproximadamente 20 minutos los grupos deben buscar formas realistas y prácticas para responder a las preguntas. Se solicita que piensen en factores y categorías que sean posibles de implementar responder las

preguntas de forma proyectiva: ¿Cómo queremos ser? ¿Qué queremos tener? ¿Qué queremos hacer? ¿Dónde queremos estar?

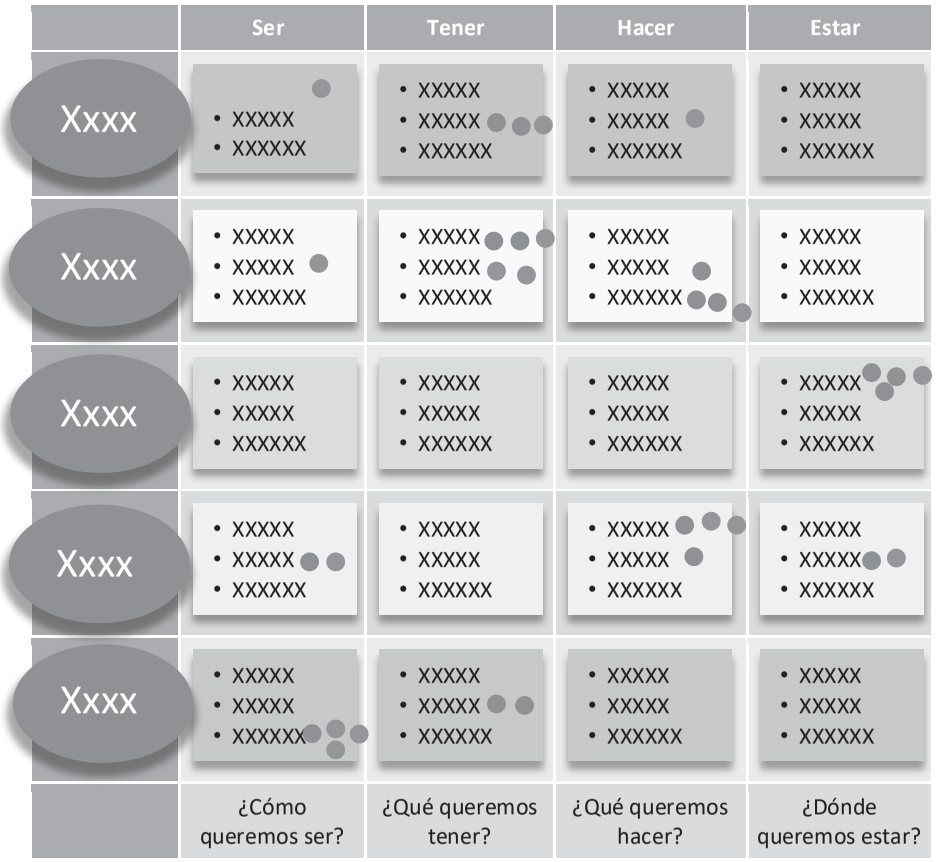
En este momento es posible introducir la diferencia entre satisfactores a) violadores o destructores; b) pseudo-satisfactores; c) satisfactores inhibidores; d) satisfactores singulares; y e) satisfactores sinérgicos.

El objetivó es encontrar elementos que pueden poner en práctica y sean sinérgicos (tengan la capacidad de satisfacer varias necesidades simultáneamente). Los resultados son presentados por los grupos en la plenaria y la matriz puente queda rellenada con satisfactores (tabla 6.2).

6.4 Jerarquización de satisfactores puentes según de Eisenhower

La facilitadora introduce la jerarquización según Eisenhower para identificar con cuáles temas el grupo quiere seguir. Cada participante recibe dos puntos rojos y dos puntos verdes por tema común y en cada fila se hace una jerarquización sobre cuales estrategias son "importantes" (punto verde) y cuales son "urgentes" (punto rojo) (Tabla 4). Para eso los participantes ponen sus puntos en la matriz que esta colocada en la pared.

Una vez que queda claro cuáles satisfactores puentes son importantes y cuáles son urgentes el grupo analiza en la plenaria la capacidad sinérgica de los satisfactores elegidos. En un siguiente paso el grupo desarrolla un plan de trabajo empezando con las satisfactores importantes y urgentes.



Satisfactores puentes que elaborados por grupos pequeños, con jerarquización según de Eisenhower (verde = importante, rojo = urgente)

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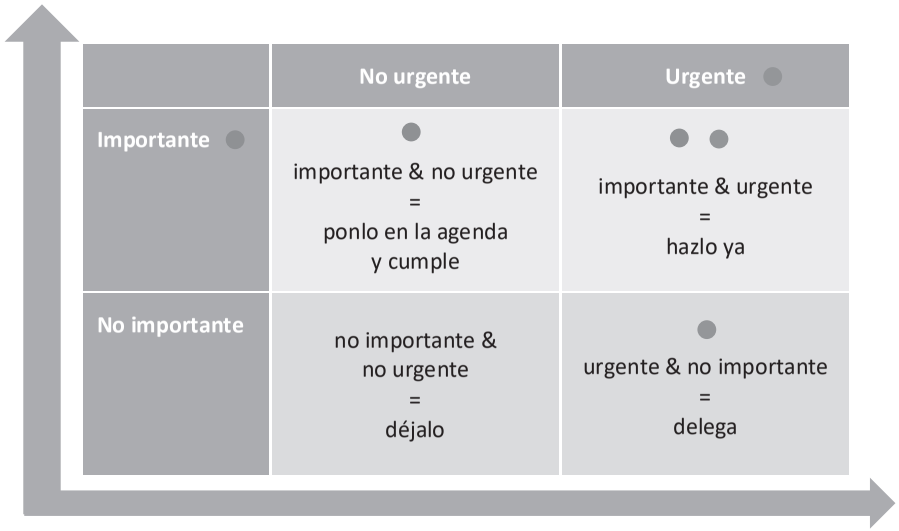

Jerarquización según de Eisenhower

6.5 Acuerdos SMART y desarrollo de un plan de trabajo

Para elaborar un plan de trabajo el grupo define tareas, personas responsables y un plazo de tiempo para poner las satisfactores en práctica. El plan de trabajo se basa en los acuerdos SMART definidos por el grupo.

SMART acuerdos	
Específico (**S**pecific)	¿Cuál es el objetivo?
Medible (**M**easurable)	¿Cómo se puede medir el logro?
Realizable (**A**chieveable)	¿Es posible lograr el objetivo? (reconociendo los recursos y las capacidades a disposición de la comunidad)
Pertinente (**R**elevant)	¿Es interesante para los miembros?
Limitado en tiempo (**T**ime bound)	¿Cuándo se quiere lograr el objetivo?

Características de SMART-acuerdos

¿Qué hay para hacer?	¿Quién?	¿(Límite) Cuándo?	¿ Comentarios?

Plan de trabajo con tareas concretas al base de características de SMART

7 Evaluación y reflexión

7.1 Evaluación del taller

Al final del taller las facilitadoras pasan a los participantes una ficha de evaluación para se contestada inmediatamente.

7.2 Cierre del taller y adopción

Después de la evaluación escrita, en una plenaria final los se realizan las siguientes preguntas:

¿Cómo se encuentra ahora? ¿Cómo se siente?
¿Que ha aprendido del taller?
¿Qué le ha resultado de utilidad? ¿Qué cosas encuentro de menor utilidad?
¿Hay algo que ha faltado? ¿ Usted tiene propuestas?

La facilitadora informa cuando la documentación del taller estará disponible y sí documentos adicionales estarán accesibles. Ella informa dónde los participantes pueden recibir más informaciones sobre el proyecto y ofrece contactarle. Agradece a los participantes y finaliza el taller.

7.3 Informe del taller

Después del taller las facilitadoras elaboran un informe, con un protocolo de todos los pasos intermedios relevantes y todos resultados del taller. Ese informe queda disponible para los participantes (un ejemplo esta colocado en el anexo).

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8 Tarjetas con necesidades

SUBSISTENCIA

La necesidad de mantenerse con vida

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

PROTECCIÓN

La necesidad de reducir o evitar riesgos

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

PARTICIPACIÓN

La necesidad de formar parte de la sociedad

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

IDENTIDAD

La necesidad de ser uno mismo

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

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AFECTO

La necesidad de amar y ser amado

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

ENTENDIMIENTO

La necesidad de entender el mundo que me rodea

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

CREACIÓN

La necesidad de expresarse mediante la producción de algo

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

LIBERTAD

La necesidad de ser responsable de mis propias acciones y ser independiente

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

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OCIO

La necesidad de tiempo libre sin trabajo remunerado

1. ¿Cómo cumplo esta necesidad?
2. ¿Qué es lo que me impide satisfacer esta necesidad?
3. ¿En qué medida apoyo a otros para satisfacer esta necesidad?

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Appendix 3
Moderationsleitfaden HSDA-Workshops

Salina Spiering Helmholtz-Zentrum für Umweltforschung, Permoserstr. 15, 04318 Leipzig, Department Umweltpolitik, Salina.spiering@ufz.de

1 Vorbereitung

1.1 Materialliste

- Datenschutzhinweis zum Unterschreiben
- Ggf. Tonband-Aufnahmegerät/Videoaufnahme
- Einverständniserklärung für Tonband-Aufnahme/Videographie
- Namensschilder
- Catering klären / Teilnehmerliste für Catering
- Drei große Stellwände
- 1 Flipchart und vobereitete Flipchartpapiere:
    - Tagesablauf für Tag 1 und Tag 2
    - Regeln für das Ausfüllen der negativen und utopischen Matrix
    - Eisenhower-Prinzip (siehe Abschnitt 6.5)
    - SMART-Vereinbarungen (siehe Abschnitt 6.6.)
    - Vorlage Arbeitsplan (siehe Abschnitt 6.6.)
- Packpapier
- Moderationskoffer
- Ausreichend Klebepunkte (rot und grün)
- Kreppband
- Laminierte Karten:
    - 9 laminierte Karten in DIN A5 (eine Karte pro Bedürfnis)
    - 4 laminierte Karten in DIN A4 (sein, haben, tun sich befinden)
    - 4 laminierte Karten mit den Fragen für die negative Matrix, die utopische Matrix, die Brückenmatrix, jeweils einzeln auf DIN A4
- Bedürfnis-Karten mit drei Fragen (siehe Abschnitt 3.2.2)
- Evaluationsbögen
- Klangschale/Gong o.ä.
- Armbanduhr

1.2 Moderation und Rollenverteilung

Eine Person moderiert den Workshop und hat möglichst professionelle Moderations-und Mediationserfahrung. Eine zweite Person assistiert, bzw. co-moderiert (bringt die Matrix an, unterstützt beim Ausfüllen, sammelt Moderationskarten ein, prüft das Aufnahmegerät, prüft Vollständigkeit der Listen etc.).

1.3 Detaillierter zeitlicher Ablaufplan

Tag 1

Wann?	Was?	Wer?	Material	Bemerkungen
16.30 – 17.00	Ankommen mit Kaffee und Kuchen		Catering	
17.00 – 17.10	Begrüßung und Kurzvorstellung des Projekts		Teilnehmer*innen-Liste; Datenschutzerklärung	
17.10 – 17.20	Vorstellungsrunde Teilnehmer*innen Erwartungen abfragen		Erwartungen auf Flipchart sammeln	
17.20 – 17.25	Ablauf des Workshops vorstellen		Tagesablauf auf Flipchart (vorbereitet)	
17.25 – 17.35	Einführung in die HSDA-Matrix inkl. Bedürfnisse		Bedürfnisblätter A5	
17.35 – 17.45	Bedürfniskarten (Übung)		Bedürfniskarten mit drei Fragen	
17.45 – 17.55	Bedürfnisse still wichten (Übung)		Laminierte Bedürfnisse einzeln	
17.55 – 18.05	Strategie-Kategorien		Strategieblätter/ Frageblätter	
18.05 – 18.30	Phase 1: Negative Matrix		Matrix an zwei Stellwänden, ausreichend gefüllte Stifte	
18.30 – 18.50	Pause			
18.50 – 19.30	Phase 1: Negative Matrix		Matrix an Stellwand, ausreichend gefüllte Stifte	
19.30 – 19.45	Wichtung der Strategien, Sammlung in neuer Spalte		Klebepunkte, rote Moderationskarten	
19.45 – 20.00	Abschlussblitzlicht			

Tag 2

Wann?	Was?	Wer?	Material	Bemerkungen
9.00 – 9.15	Ankommen: Begrüßung neuer Teilnehmer*innen, Vorstellungsrunde			
9.15 – 9.30	Rekapitulation des vorherigen Tages			
9.30 – 10.30	Phase 2: Utopische Matrix		Leere Matrix an zwei Stellwänden	
10.30 – 10.50	Pause			
10.50 – 12.15	Phase 2: Utopische Matrix		Matrix	
12.15 – 12.30	Wichtung der Strategien und Sammlung in einer neuen Spalte		Klebepunkte, rote Moderationskarten	
12.30 – 13.30	Mittagspause			
13.30 – 14.00	Brückenschlag negative und utopische Matrix: clustern		Moderationskarten in Farben entsprechend der Gruppenanzahl	
14.00 – 15.00	Kleingruppenarbeit		Neue Matrix	
15.00 – 15.30	Kaffeepause			
15.30 – 16.30	Eisenhower-Wichtung und SMARTE Vereinbarungen reffen		Tabelle	
16.30 – 17.00	Evaluation und Abschluss		Evaluationsbögen	

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2 Begrüßung und Eingangsphase

2.1 Vorstellung des Projekts

Kurzvorstellung des Projektes mit Projektziel, Fördergeber*innen, beteiligten Akteur*innen und Projektzielen. Vorstellung der Moderatorin und Co-Moderation. Ggf. Begrüßungsworte der/des Gastgeber*in.

Ziele des Workshops die gemeinsam im Vorfeld entwickelt wurden, vorstellen und ggf. anpassen. Transparenz herstellen bzgl. möglicher vorhergehender Interviews.

2.2 Vorstellungsrunde der Teilnehmer*innen

Vorstellungsrunde: Name, Stellung in der Gruppe, Erwartung an die Veranstaltung und die Frage – was inspiriert mich?

Ggf. Aufstellung im Raum: Wie lange sind Sie Mitglied in Gruppe X?

3 Einführung in den Workshop

3.1 Organisatorisches

Der Workshop dauert insgesamt anderthalb Tage und ist in drei Phasen eingeteilt – Vorstellung des vorbereiteten Tagesablaufes am Flipchart:

Tag 1

- Begrüßung und Vorstellung
- Ansatz zur Entwicklung nach menschlichem Maß
- Negative Matrix: was behindert unsere Entwicklung?
- Evaluation und Abschluss

Zeiten: 17.00 – 20.00 Uhr, Pause nach Bedarf

Flipchartvorlage Ablaufplan Tag 1

Vertraulichkeit sicherstellen und Datenschutzerklärung unterschreiben lassen – das was besprochen wird, bleibt im Raum.

3.2 Inhaltliche Einführung

3.2.1 Einführung in die HSDA-Matrix

Hintergrund zur Methode:

Die Methode mit der wir arbeiten heißt "Methode zur Entwicklung nach menschlichem Maß" und wurde von dem chilenischen Ökonom Manfred Max-Neef und seinen Kollegen entwickelt. Max-Neef war alternativer Nobelpreisträger und arbeitete zu den Themen Nachhaltigkeit und Lebensqualität. Die Matrix wurde seit den 80er Jahren von verschiedensten Gruppen v.a. in Südamerika benutzt, um sowohl Schwachstellen als auch den Wohlstand/die Möglichkeiten einer Gesellschaft/Gruppe zu identifizieren. Bzw. auf der Basis der Bedürfnisse der Menschen Entwicklungsstrategien zu finden – wie wollen wir leben? Was hindert uns? Und wie kommen wir zum Ziel?

Im Workshop und im Rahmen des Forschungsprojekts nutzen wir die Matrix und entwickeln sie weiter – am Ende des Workshops bekommen die Teilnehmer*innen einen Evaluationsbogen, den sie bitte ausfüllen, zur eigenen Reflexion und damit wir sehen können, was wertvoll/hilfreich usw. war und wie der Workshop weiterentwickelt/angepasst werden kann. Herzstück der Methode ist eine Matrix aus Bedürfnissen und Strategien, um diese Bedürfnisse zu erfüllen.

In der ersten Spalte steht eine Auswahl menschlicher Grundbedürfnisse, die Max-Neef zusammengetragen hat (aus den Erfahrungen die er in der Arbeit mit den verschiedenen Gruppen gemacht hat). Um die mit den Bedürfnissen vertraut zu werden, folgen zwei Übungen:

3.2.2 Bedürfniskarten (Übung)

Um mit den Bedürfnissen vertraut zu werden, werden Karten mit den neun Bedürfnissen (siehe Anhang Bedürfniskarten) ausgeteilt; jede Person wählt eine Karte und beantwortet zunächst für sich folgende Fragen:

- Auf welche Weise erfülle ich mir dieses Bedürfnis?
- Was hindert mich daran, dieses Bedürfnis zu erfüllen?
- Inwieweit unterstütze ich andere darin, sich dieses Bedürfnis zu erfüllen?

Im Anschluss gehen die Teilnehmer*innen in ein Zweiergespräch und tauschen sich über die Fragen aus. Dann werden die Ergebnisse kurz im Plenum zusammengefasst. Für jedes Bedürfnis, das genannt wird, legt die Moderatorin eine laminierte DIN-A-4-Karte mit dem

Bedürfnis auf den Boden. Die Moderatorin fragt, ob es ein weiteres wichtiges Bedürfnis gibt, das hier ergänzt werden soll.

3.2.3 Stille Wichtung

Ein kurzes Spiel gibt ein Stimmungsbild, welche Bedürfnisse die Teilnehmer*innen aktuell als wichtig in der Gruppe/Gemeinschaft empfinden.

Die Teilnehmer*innen werden gebeten, die bereits auf dem Boden liegenden neun Bedürfnisse nach ihrer Wichtigkeit zu sortieren – welche Bedürfnisse spielen in der Gruppe zum aktuellen Zeitpunkt eine größere, welche eine kleinere Rolle?

Regel: Das Spiel dauert drei Minuten. Jede*r darf die Karten bis zum Schlusssignal immer wieder an einen anderen Ort legen; es wird dabei nicht gesprochen.

Die Moderatorin gibt nach 3 Minuten ein Schlusssignal, weiteres Wechseln der Karten ist nicht erlaubt. Eine ausführliche Auswertung bleibt zu diesem Zeitpunkt aus. Am Ende des Workshops kann darauf Bezug genommen werden.

Die Moderatorin pinnt die Bedürfnisse in der Reihenfolge der Wichtung untereinander an die Stellwand.

3.2.4 Einführung in die (existenziellen) Strategien-Kategorien

Eine Hauptidee von Max-Neef und Kollegen ist die Unterscheidung von Bedürfnissen (axiologischen Kategorien) und Strategien (existenziellen Kategorien) zur Erfüllung der Bedürfnisse. Allgemein wird uns suggeriert, z.B. ein (spezielles) Auto zu besitzen, sei ein wichtiges Bedürfnis. Das Auto wird bei Max-Neef allerdings als Strategie verstanden, um sich z.B. das Bedürfnis nach Freiheit zu erfüllen. Andere Menschen wiederum erfüllen sich ihr Bedürfnis nach Freiheit indem sie spazieren gehen, reisen o.ä. Das heißt, in seiner Theorie teilen alle Menschen die gleichen Bedürfnisse, unabhängig von Zeit, Kultur und Ort. Was sich unterscheidet sind die Strategien zur Erfüllung der Bedürfnisse und diese Strategien sind sehr individuell und abhängig von den vorhandenen Ressourcen. Gleichzeitig betont Max-Neef auch nicht-materielle Strategien zur Bedürfniserfüllung.

Die Moderatorin stellt die existenziellen Kategorien vor, die die Arten und Weisen ausdrücken, Bedürfnisse zu erfüllen; sie pinnt die laminierten Karten und die dazugehörigen Fragen horizontal an die Stellwand und spannt damit die Matrix aus Bedürfnissen und existenziellen Kategorien auf:

Sein: persönliche oder kollektive Merkmale. Die Spalte "sein" sammelt alle Eigenschaften von Personen oder Gruppen in Form von Adjektiven und gibt eine Antworten auf die Frage: Wie sind wir/nicht? Das Bedürfnis nach Beteiligung kann zum Beispiel nicht erfüllt werden, wenn Menschen rassistisch, teilnahmslos, übermächtig, arrogant, apathisch etc. sind. (optimal: anpassungsfähig, solidarisch, integrativ, offen, respektvoll, etc.)

Haben: bezieht sich auf Institutionen, Normen, Mechanismen, Gesetze, materielle Güter etc. und gibt Antwort auf die Frage: was haben wir/nicht? Am Beispiel des Bedürfnisses nach Beteiligung könnte stehen: diskriminierende Bildungsgesetze, repressive Institutionen, Korruption, Arbeitslosigkeit, etc.. (optimal: Menschenrechte, Verantwortlichkeiten, (Voll)Beschäftigung etc.)

Tun: bezieht sich auf persönliche oder kollektive Aktivitäten (zum Beispiel lesen, lernen, sich austauschen, sich informieren etc.) und gibt Antwort auf die Frage: was tun wir/nicht? Die Spalte tun bezieht sich auf Handlungen von Personen oder Gruppen: am Beispiel des Bedürfnisses nach Beteiligung könnte stehen diskriminieren, unterdrücken, aufzwingen, einschränken etc. (optimal: beteiligen, kooperieren, einbringen, teilen, Stellung nehmen, vereinbaren).

Sich befinden: Diese Spalte bezieht sich auf Rahmenbedingungen, Orte und Umgebungen in Zeit und Raum und gibt Antwort auf die Frage: wo befinden wir uns/nicht? Zum Beispiel das Fehlen von öffentlichen Plätzen oder Parks um sich zu treffen um z.B. das Bedürfnis nach Beteiligung zu erfüllen (optimal: Kooperativen, Vereinigungen, Kirchen, Familien, Gemeinschaften).

Die Felder der Matrix sind zunächst leer und sollen in der kommenden Diskussion gemeinsam gefüllt werden.

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4 Negative-Matrix

	Sein	Haben	Tun	Sich befinden
Selbsterhalt				
Schutz				
Zuneigung				
Erkenntnis				
Teilhabe				
Muße				
Gestaltung				
Identität				
Freiheit				
	Wie sind wir/nicht?	Was haben wir/nicht?	Was tun wir/nicht?	Wo befinden wir uns/nicht?

Aufgespannte negative Matrix inklusive Bedürfnissen, existenziellen Kategorien und Orientierungsfragen

4.1 Ausfüllen der Negativen-Matrix

Die Moderatorin führt in die nächste Phase ein: diese Phase dient dazu, alle Faktoren zu sammeln, die die Weiterentwicklung der Gruppe aktuell behindern. Sie lädt die Teilnehmer*innen ein, alle Missstände zu benennen und diese Phase zu nutzen, um Ärgernisse loszuwerden. Hier ist es wichtig, dass die Moderation Diskussionen und persönlichen Angriffe unterbindet, bzw. Anschuldigungen umformuliert ("Für Sie ist das wichtig, weil damit Ihr Bedürfnis nach X (nicht) erfüllt ist?"). Die Moderatorin weist darauf hin, dass diese Sammlung auch anstrengend oder frustrierend sein kann. Sie bittet die Teilnehmer*innen sich dennoch darauf einzulassen und sich an die Regeln zu halten, die sie kurz einführt und auf einem Flipchart aufhängt:

Regeln zum Ausfüllen der negativen Matrix

- Lassen Sie andere Teilnehmer*innen aussprechen
- Strategien sammeln, ohne zu diskutieren
- Reden Sie Probleme nicht klein (á das ist doch nicht so schlimm)
- Konzentrieren Sie sich auf die negativen Faktoren

Flipchartvorlage Regeln zum Ausfüllen der negativen Matrix

Im Plenum beginnen die Teilnehmer*innen die negativen Elemente zu nennen, die die Bedürfniserfüllung der Gruppenmitglieder behindern und ggf. eigenständig eine Zuordnung zu den Bedürfnissen und existenziellen Kategorien zu formulieren. Die Moderatorin unterstützt sie in der Zuordnung bzw. formuliert um und fragt nach, welches Bedürfnis durch die jeweilige Strategie eingeschränkt wird (sollte eine Strategie die Erfüllung mehrerer Bedürfnisse behindern, wird diese Strategie an mehreren Stellen niedergeschrieben). Die beiden Moderatorinnen schreiben die genannten Aspekte in die Matrix. Das Ausfüllen der Matrix erfolgt ohne festen Ablauf in der Reihenfolge der Nennungen und ermutigt alle Teilnehmer*innen zu der Sammlung beizutragen. Sollte ein Feld frei bleiben, benennt die Moderatorin dies und fragt, ob es Faktoren gibt, die in diese Kategorie passen.

4.2 Clustering the most important strategies for each need

When the collection of negative factors is exhausted, the one or two most important factors per need shall be identified. In order to do so it is recommendable to work with the sticky dots. Each participant may assign two red dots per need; in the end the one or two negative factors per need with most dots are written onto red moderation cards and attached to the matrix.

4.3 Abschlussblitzlicht Tag 1

Zum Abschluss des ersten Abends bedankt sich die Moderator*in bei den Teilnehmer*innen für deren Offenheit, Vertrauen und Durchhaltevermögen und wertschätzt das Erarbeitete. Kurze Frage an alle Teilnehmer*innen:
Wie geht es Ihnen jetzt?
Was nehmen Sie mit, was lassen Sie hier?

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	Sein	Haben	Tun	Sich befinden	Wichtigste negative Faktoren
Selbst-erhalt	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx Xxxxx xxxxxx	Xxxxx
Schutz	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx Xxxxx	Xxxxx
Zuneigung	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Erkenntnis	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Teilhabe	xxxxx	xxx	xxxxx	xxxxx	Xxxxx
Muße	xxxxx	xxxxx	xxxxx	xxx	Xxxxx
Gestaltung	xxxxx	xxxxx	xxx	xxxxx	Xxxxx
Identität	xxx	xxxxx	xxxxx	xxxxx	Xxxxx
Freiheit	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
	Wie sind wir/nicht?	Was haben wir/nicht?	Was tun wir/nicht?	Wo befinden wir uns/nicht?	

Punktabfrage zur Identifikation der wichtigsten Strategien pro Bedürfnis negative Matrix und Zusammenfassung auf Moderationskarten

5 Utopische Matrix

5.1 Einführung Tag 2

Zum Beginn des zweiten Tages werden ggf. neue Teilnehmer*innen kurz vorgestellt und die Ergebnisse des Vortages werden von der Moderatorin zusammengefasst. Dann stellt sie den Tagesablauf des zweiten Tages am Flipchart vor:

Tag 2

- Utopische Matrix: wie wollen wir uns entwickeln?
- Brückenstrategien: wie kommen wir dahin?
- SMARTE Vereinbarungen treffen: wer macht was, wann?
- Evaluation und Abschluss

Zeiten: 09.00 – 17.00 Uhr, Pausen: 12.30-13.30 u. nach Bedarf

Flipchartvorlage Ablaufplan Tag 2

5.2 Übung zur Einstimmung auf die utopische Matrix: Reise in die Zukunft

Die Moderatorin lädt die Teilnehmer*innen zu der Übung "eine Reise in die Zukunft" ein, um sich auf die utopische Matrix einzustimmen. Wer möchte, kann dazu die Augen schließen und es sich auf dem Stuhl bequem machen: "Stellen Sie sich vor, es ist das Jahr 2030. Sie können sich wenn Sie möchten vorstellen, dass Sie in einem Heißluftballon oder ähnlichem über die Landschaft fliegen und Sie können sich eine Zukunft erträumen, wie Sie in Ihren Augen optimal ist; alle Menschen können sich ihre Bedürfnisse erfüllen: wie geht es Ihnen und Ihren Mitmenschen (in Ihrer Gruppe/Gemeinde/Gemeinschaft/Gesellschaft X)? Was sehen Sie? Wie sind die Menschen? Wie verhalten Sie sich? Welche Güter, Dienstleistungen, Normen und Gesetze haben Sie? Unter welchen Rahmenbedingungen leben Sie? Nehmen Sie sich noch einen Augenblick Zeit, sich das Geschehen in Ruhe anzusehen und kommen Sie dann zurück ins Hier und Jetzt. Wenn Sie es noch nicht getan haben, bringen Sie Ihre Aufmerksamkeit zurück in diesen Raum ins Hier und Heute."

5.3 Ausfüllen der utopischen Matrix

Im nächsten Schritt sind die Teilnehmer*innen eingeladen, alle Faktoren zu nennen, die zu einer optimalen und idealen Erfüllung der Bedürfnisse beitragen. Es ist dabei ausdrücklich erwünscht, auch verrückte, unmögliche Dinge zu träumen und lustvoll Ideen zu spinnen. Die Regeln lauten hier:

Regeln zum Ausfüllen der utopischen Matrix

- Alles ist möglich
- Denken Sie sich Großes und auch Unmögliches aus!
- Zweifeln Sie nicht
- Träumen Sie!

Flipchartvorlage Regeln zum Ausfüllen der utopischen Matrix

	Sein	Haben	Tun	Sich befinden
Selbsterhalt				
Schutz				
Zuneigung				
Erkenntnis				
Teilhabe				
Muße				
Gestaltung				
Identität				
Freiheit				
	Wie sind wir optimalerweise?	Was haben wir optimalerweise?	Was tun wir optimalerweise?	Wo befinden wir uns optimalerweise?

Aufgespannte utopische Matrix inkl. Bedürfnissen, existenziellen Kategorien und Orientierungsfragen

Wie auch beim Ausfüllen der negativen Matrix werden von den Teilnehmenden im Plenum nun alle Faktoren genannt, die eine optimale Erfüllung der Bedürfnisse bedeuten. Folgende Leitfragen dienen zur Orientierung in der Diskussion: wie sind wir optimalerweise, was haben wir optimalerweise, was tun wir optimalerweise und in welchen Rahmenbedingungen befinden wir uns optimalerweise? Die Moderator*innen unterstützen bei der Zuordnung in die Matrix und schreiben die genannten Strategien auf.

5.4 Punktabfrage zur Identifikation der wichtigsten Strategien pro Bedürfnis

Wenn die Nennung aller utopischen Faktoren erschöpft ist, werden pro Bedürfnis die ein bis zwei wichtigsten Faktoren identifiziert. Jede/r Teilnehmer*in erhält zwei Klebepunkte pro Bedürfnis; am Ende werden die am häufigsten genannten utopischen Faktoren auf grüne Moderationskarten geschrieben und an die Matrix angehängt.

	Sein	Haben	Tun	Sich befinden	Wichtigste utopische Faktoren
Selbst-erhalt	Xxxxx Xxxxx ● xxxxxx	Xxxxx ● ● ● Xxxxx ● xxxxxx	Xxxxx Xxxxx ● xxxxxx	Xxxxx ● Xxxxx ● xxxxxx	Xxxxx
Schutz	Xxxxx ● Xxxxx ● ●	Xxxxx ● Xxxxx ●	Xxxxx ● Xxxxx ● ●	Xxxxx ● ● Xxxxx	Xxxxx
Zuneigung	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Erkenntnis	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
Teilhabe	xxxxx	xxx	xxxxx	xxxxx	Xxxxx
Muße	xxxxx	xxxxx	xxxxx	xxx	Xxxxx
Gestaltung	xxxxx	xxxxx	xxx	xxxxx	Xxxxx
Identität	xxx	xxxxx	xxxxx	xxxxx	Xxxxx
Freiheit	xxxxx	xxxxx	xxxxx	xxxxx	Xxxxx
	Wie sind wir optimaler-weise?	Was haben wir optimaler-weise?	Was tun wir optimaler-weise?	Wo befinden wir uns opti-malerweise?	

Punktabfrage zur Identifikation der wichtigsten Strategien pro Bedürfnis utopische Matrix und Zusammenfassung auf Moderationskarten

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6 Strategieentwicklung

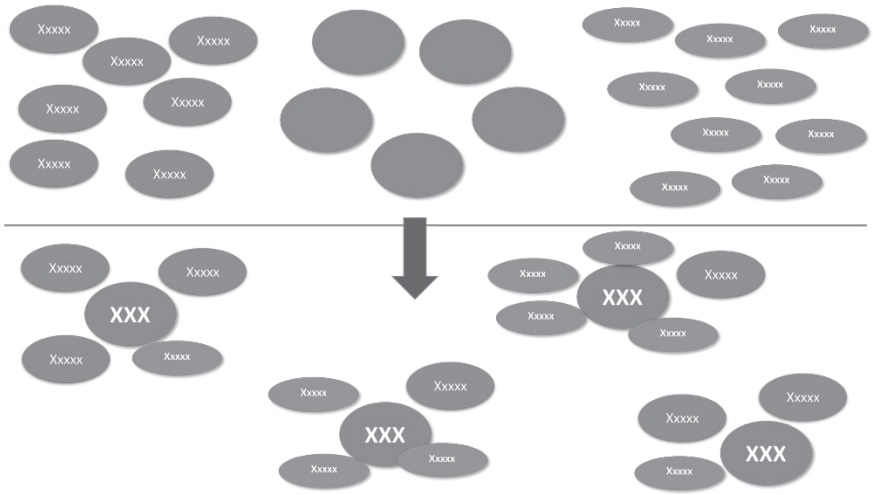
6.1 Brückenschlag zwischen negativer und utopischer Matrix

In dieser Phase werden die Konzepte und Kategorien identifiziert, die sich aus den wichtigsten Strategien der utopischen und negativen Matrix ergeben. Es wird eine Antwort auf die Frage gegeben: Worum geht es eigentlich?

6.2 Clustern und Überbegriffe finden

Dazu werden die wichtigsten utopischen Faktoren auf grünen Moderationskarten (die beschreiben, wie die Gruppe/Gesellschaft optimalerweise sein soll, damit die Bedürfnisse der Mitglieder optimal erfüllt sind) und die wichtigsten negativen Faktoren auf roten Moderationskarten (Herausforderungen, die in der Gruppe/Gesellschaft gemeistert werden wollen) auf einer Pinnwand jeweils auf eine Seite gehängt. Die Teilnehmenden werden gebeten, die Gemeinsamkeiten und Essenzen der Faktoren zu identifizieren und gemeinsame Überbegriffe vorzuschlagen.

Diese Überbegriffe werden als Cluster an die Pinnwand gepinnt. Es sollen maximal fünf Überbegriffe gefunden werden.



Überbegriffe aus den wichtigsten negativen und utopischen Faktoren bilden

6.3 Tabelle aus Überbegriffen und Brückenstrategien

Diese fünf Überbegriffe werden in einer neuen Tabelle anstelle der Bedürfnisse platziert, die existenziellen Kategorien verbleiben in der ersten Zeile, die Boxen werden mit Brückenstrategien gefüllt.

	Sein	Haben	Tun	Sich befinden
Xxxxx				
Xxxxx				
Xxxxx				
Xxxxx				
Xxxxx				
	Wie möchten wir sein?	Was möchten wir haben?	Was möchten wir tun?	Wo möchten wir uns befinden?

Tabelle mit Brückenstrategien

6.4 Brückenstrategien in Kleingruppen erarbeiten

Die Teilnehmenden arbeiten in Gruppenarbeit weiter und suchen sich eine Oberkategorie zu der sie gerne arbeiten möchten. Die Anzahl der Gruppen ist abhängig von der Anzahl der Überkategorien. Begonnen wird mit der ersten Überkategorie und es wird gefragt: wie möchten wir sein, damit mehr XXX in der Gruppe/Gesellschaft gelebt wird? Danach werden Strategien für die Spalten haben, tun und sich befinden gefunden.

An dieser Stelle ist es auch möglich, die Teilnehmenden auf die Unterscheidung Max-Neefs bezüglich der Strategien hinzuweisen:

- Zerstörerische Strategien, die die Bedürfniserfüllung verunmöglichen
- Quasi-Strategien, die nur vorgeben ein Bedürfnis zu erfüllen
- Übersättigende Strategien, die Bedürfnisse übererfüllen und damit die Bedürfniserfüllung anderer Bedürfnisse verhindern

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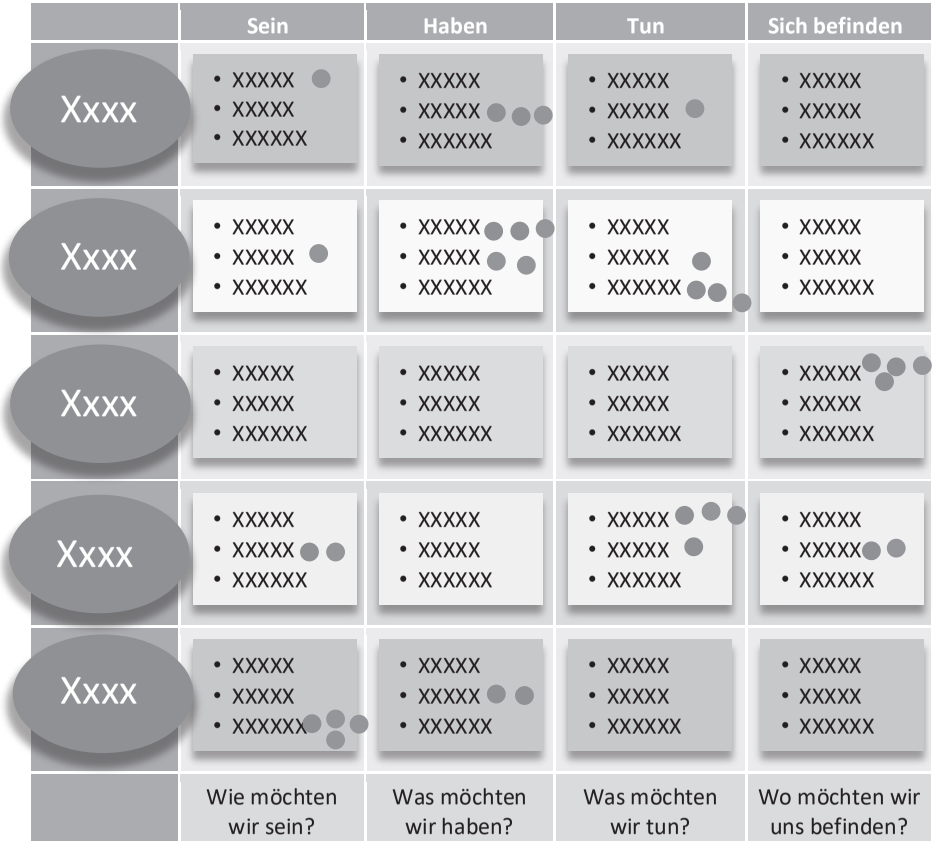
- Singuläre Strategien, die nur ein Bedürfnis erfüllen
- Synergetische Strategien stimulieren die Erfüllung mehrerer Bedürfnisse

Das Ziel ist es, Elemente/Maßnahmen zu identifizieren, die praktisch umgesetzt werden können und in die Kategorie synergetische Strategien fallen. Die Ergebnisse werden im Plenum von den Kleingruppen vorgestellt und die Brücken-Matrix mit den synergetischen Strategien gefüllt.

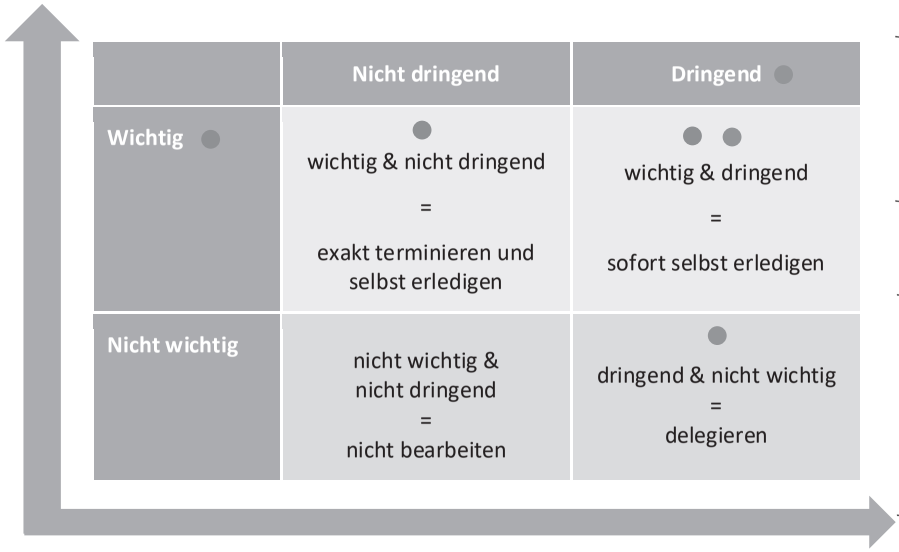


Brückenstrategien, die in Kleingruppen erarbeitet wurden mit Wichtung nach dem Eisenhower-Prinzip (grün=wichtig, rot=dringend)

6.5 Eisenhower-Prinzip: Wichtung der Brücken-Strategien

In einer Mehrpunktabfrage (zwei Punkte je Teilnehmende pro Überbegriff) wird in jeder Zeile festgelegt, welche Strategien "wichtig" (roter Punkt) und welche "dringend" (grüner Punkt) sind.

Wenn die wichtigsten und dringendsten "Brücken"-Strategien festgelegt sind, wird im Plenum besprochen, ob die Strategien "synergetisch" sind (das heißt, dass sie mehr als ein Bedürfnis erfüllen, welche diese sind und weshalb) und ob die Gruppe/Gesellschaft die Strategien selbst umsetzen kann oder welche Partner*innen/Unterstützer*innen es braucht. Danach wird nach dem Eisenhower-Prinzip festgelegt, welche Brückenstrategien in einem konkreten Arbeitsplan umgesetzt werden. Dabei wird so vorgegangen, dass zunächst die wichtigen & dringenden Strategien besprochen werden, dann die dringenden und dann die wichtigen.



Eisenhower-Prinzip – Priorisierung der Brückenstrategien

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6.6 SMARTe Vereinbarungen

Für die Entwicklung eines konkreten Arbeitsplanes und die Umsetzung der Strategien werden für die wichtigen und dringenden Brücken-Strategien in einer SMART-Analyse Verantwortliche festgelegt:

SMART-Vereinbarungen	
Schriftlich fixiert, klar und präzise	Was ist das Ziel?
Messbar	Wie kann die Zielerreichung gemessen werden?
Anspruchsvoll, herausfordernd	Ist das Ziel für die Teilnehmenden interessant, werden die sie motiviert?
Realistisch	Kann das Ziel erreicht werden?
Terminiert	Bis wann soll das Ziel erreicht werden?

Eigenschaften von SMART-Vereinbarungen

Was ist zu tun?	Wer?	Bis wann?	Bemerkungen?

Arbeitsplan mit konkreter Aufgabenverteilung auf Basis der SMART-Eigenschaften

7 Evaluation und Reflektion

7.1 Evaluation des Workshops

Zum Abschluss des Workshops teilen die Moderatorinnen einen Evaluationsbogen aus, den die Teilnehmenden vor Ort direkt ausfüllen.

7.2 Abschlussrunde und Verabschiedung

Im Anschluss erfolgt eine mündliche Abschlussrunde mit den folgenden Fragen:

Wie geht es Ihnen?

Was haben Sie aus dem Workshop mitgenommen?

Was hat Ihnen gut getan, was hätten Sie nicht gebraucht?

Welche Anregungen haben Sie?

Die Moderatorin gibt einen Ausblick, wann die Workshop Dokumentation und ggf. weitere Dokumente zugänglich sein werden und informiert darüber, wo weitere Informationen zum Projekt abrufbar sind. Sie bietet sich für Rückfragen an und dankt allen für die Teilnahme.

Verabschiedung und Workshopausklang.

7.3 Workshopbericht

Im Anschluss an den Workshop erstellen die Moderatorinnen einen Workshopbericht mit dem Protokoll aller relevanten Zwischenschritte und ggf. Fotos. Dieser Workshopbericht wird den Teilnehmenden zur Verfügung gestellt.

8 Bedürfniskarten

SELBSTERHALT

Das Bedürfnis, am Leben zu bleiben

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

IDENTITÄT

Das Bedürfnis, man selbst zu sein

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

SCHUTZ

Das Bedürfnis, Risiken ausgesetzt zu sein zu reduzieren

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

GESTALTUNG

Das Bedürfnis, sich auszudrücken indem man etwas produziert

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

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LIEBE

Das Bedürfnis, Liebe zu geben und zu empfangen

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

TEILHABE

Das Bedürfnis, aktiver Teil der Gesellschaft zu sein

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

ERKENNTNIS

Das Bedürfnis, zu verstehen

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

Muße

Das Bedürfnis, nach Freizeit ohne Lohnarbeit

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

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FREIHEIT

Das Bedürfnis, verantwortlich für die eigenen Handlungen zu sein

1. Auf welche Weise erfüllst du dir dieses Bedürfnis?
2. Was hindert dich daran, dieses Bedürfnis zu erfüllen?
3. Inwieweit unterstützt du andere darin, dieses Bedürfnis zu erfüllen?

Appendix 4

Guía de Moderación: Talleres del DEH

(como presentado por Barrera)

Maria del Valle Barrera
Programa de Magister en Desarrollo a Escala Humana y Economía Ecológica.
Instituto de Economía. Universidad Austral de Chile. mvallebarrera@gmail.com

A-Preparación y organización de taller

El taller se estructura en tres módulos y se prepara y planifica en relación a la investigación o intervención- La facilitación debe contar con información previa que le permita tomar decisiones para garantizar el cumplimiento de los objetivos del taller, y adaptarse flexiblemente a los cambios que pueden ocurrir en el transcurso del mismo. Ya sea si el taller es encargado por un investigador, proyecto, empresa u organización o si el investigador/facilitador lo realiza para su propio proyecto, se deben tomar en cuenta las siguientes consideraciones:

A.1 Organización del taller y adecuación y ajuste al proyecto

Mediante reuniones previas la facilitación conoce los objetivos de la investigación y el alcance que espera lograr (diagnosticar, explicar, planificar y/o implementar un proceso de cambio). Los organizadores conocen anticipadamente las potencialidades y limites del ejercicio, los requerimientos en tiempo y el tipo de resultados a los que puede llegar.

A.2 Consideraciones logísticas, preparación sala y materiales

Espacio y mobiliario:

- Sala con suficientes sillas y espacio libre en las paredes para colgar los posters.
- Mesas de trabajo (módulo 2)

Bienvenida:

- Registros de inscripción de participantes
- Consentimientos informados impresos
- Encuestas o cuestionarios de inicio impresos
- Distintivos para nombres- identificación
- Proyector o tarjetas de actividad de motivación

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Trabajo Taller:

- 9 posters de necesidades axiológicas
- 2 sets de posters con preguntas para las necesidades existenciales
- 2 matrices completas vacías (soportes para colgar o pegar en la pared)
- post it de 2 colores (suficientes)
- tarjetas de transcripción de satisfactores (modulo 2)
- plumones de pizarra
- pizarra o papelógrafo

Coffe break:

- Disponibilidad de café, agua, galletas, dulces/fruta en la sal

A.3 Capacitación equipo de facilitación

Si el grupo de participantes es más de 8-10 personas se requiere de más de un facilitador/a. Cuando el taller se realiza en el marco de un proceso formativo, o de investigación los facilitadores conocen previamente la teoría y principios teóricos y metodológicos del DEH de Max-Neef, Elizalde y Hopenhayn. (1986) De lo contrario es necesario capacitar a los facilitadores en el marco de DEH. Los resultados son sensibles a las habilidades de escucha, moderación, manejo de equipos por lo que las habilidades y experiencia de la facilitación son consideraciones previas a tomar en cuenta

A.4 Convocatoria a los participantes

La convocatoria debe realzarse anticipadamente y de ser posible confirmada. La facilitación debe saber el contexto en el cual se realiza la convocatoria de los participantes y la información, expectativas (y prejuicios) que pudiesen tener respecto del taller. Por ejemplo si asisten de manera auto-convocada, de forma voluntaria, o en el contexto de una invitación- solicitud laboral, si asocian su invitación a una tendencia política o a un interés privado en particular.

A.5 Preparación de instrumentos de inicio

Se preparan anticipadamente un cuestionario consentimiento informado y cuestionario base. El consentimiento informa y asegura la confidencialidad de las opiniones y protege a los participantes. El cuestionario de inicio recoge información relevante de base para caracterizar a los participantes, y percepciones de inicio para triangular resultados.

1- Módulo 1: Diagnóstico de Necesidades y Satisfactores

1.1 Inscripción y entrega de formularios

Se reciben a los participantes, registra asistencia y datos de contacto. Se entregan los consentimientos y los cuestionarios de entrada.

1.2 Bienvenida y presentación del proyecto y participantes

Para esta primera actividad se forma un círculo con las sillas, donde todos los presentes pueden verse Los investigadores y/o facilitadores dan la bienvenida, contextualizan el taller y los propósitos del proyecto en el que se encuentran. Los Participantes se presentan uno a uno. (duración aprox. 10-15 min)

1.3 Actividad de motivación

Los talleres de DEH evalúan la satisfacción de las necesidades de un grupo que comparte características, pertenencias, y/o roles definidos. La actividad de motivación genera confianzas y orienta la conversación en torno a esas formas identitarias y la satisfacción de las necesidades (etnicidad, maternidad, juventud, territorio-). (duración aprox. 10-15 min)

1.4 Formación de grupos

Utilizando algún tipo de dinámica se forman grupos para trabajar en torno a la búsqueda de satisfactores para las necesidades humanas fundamentales (NHF). Dependiendo de la cantidad de participantes, se recomienda que los grupos no excedan las 8-10 personas. Por cada grupo hay uno o dos facilitadores por grupo. (duración aprox. 5 min)

1.5 Conversación grupal en torno a satisfacción de necesidades

Se disponen en la sala un poster para cada necesidad dividido en cuatro cuadrantes cada uno de los cuales tiene la dimensión existencial del ser, tener, hacer y estar. Los grupos se ubican en torno a uno o dos poster de las necesidades humanas en la búsqueda de “elementos positivos y negativos” en su satisfacción.

El facilitador explica que la conversación para cada necesidad será guiada por preguntas:. Estas preguntas se encuentran visibles en la sala en 4 posters/cartulinas de colores

- **Ser**: ¿Cómo somos? ¿Cómo queremos ser? Buscando registrar atributos o características personales o colectivas
- **Tener**: ¿Qué recursos tenemos? ¿Cuáles queremos tener? Registrando normas, instituciones, costumbres, prácticas, mecanismos y herramientas del grupo (excluyendo objetos).
- **Hacer:** ¿Qué hacemos nosotros? ¿Qué nos gustaría hacer? Registrando verbos o acciones
- **Estar**: ¿Cuáles y cómo son los espacios y lugares de nuestras interacciones? se registran los espacios y ambientes donde se satisfacen las necesidades

Los participantes conversan sobre la forma en la que ellos consideraban que se satisface cada necesidad identificando lo positivo en papeles adhesivos (tipo *post-it*) de un color y lo negativo en papeles de otro color. Todos los participantes pueden comentar, escribir en los papeles y colocar los satisfactores en el cuadrante que consideren. El facilitador apoya este proceso manteniendo una actitud de escucha, y se mantiene neutro en la manifestación de sus opiniones. Puede hacer altos en la conversación para recapitular, afinar la descripción del satisfactor y hacer nuevas preguntas que permitan la mejor delimitación de los satisfactores. Mantienen equilibrio de opiniones, impidiendo que algunos acaparen la conversación y otros permanezcan en silencio.

Dependiendo del grupo, su motivación, confianza entre otros, la conversación puede durar entre 15-30 minutos por necesidad. Cuando la conversación se satura, el facilitador repite las preguntas para la siguiente necesidad ubicada a su lado. El facilitador y un miembro del grupo revisa los resultados y consulta si están bien ubicados y escritos. Luego de 1 hr- 1:30 se hace una pausa. Si el grupo demoró menos tiempo en esta etapa, es posible continuar con el siguiente ejercicio.

1.6 Rotación o socialización.

Como las personas han participado en una conversación profunda de sólo 2 o 3 de las 9 necesidades se buscan instancias para compartir y validar los resultados de cada grupo. Esto puede hacerse mediante la exposición plenaria de los resultados o por un ejercicio de rotación de grupos.
En el caso de la exposición, uno o dos integrantes del grupo explican en plenaria las los resultados de satisfactores negativos y positivos para cada necesidad. Posteriormente se abre un espacio para aclarar, incorporar nuevos satisfactores o realizar preguntas. Este ejercicio de exposición por necesidad puede durar aprox. 45 min- 1 hr.

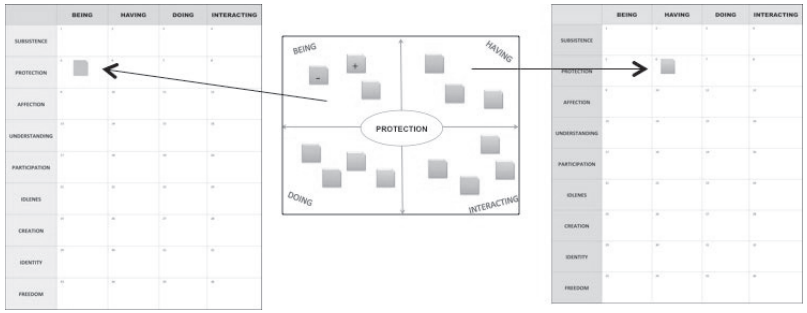
En el caso de la rotación, la facilitadora solicita que un integrante del grupo permanezca en su lugar, frente al/los poster de las necesidades, y el resto de los integrantes roten o se desplacen hacia otros posters con otras necesidades donde previamente otro grupo respondió las preguntas para esas necesidades. El integrante que se queda hace de anfitrión, explica los satisfactores seleccionados por el grupo anterior y apoyado por el facilitador pregunta si están de acuerdo, y si quieren agregar otros satisfactores, ejemplificar o hacer diferencias. Este ejercicio de rotación puede durar aprox. 30-40 min.

Cuando el espacio físico es mas pequeño o hay menos disposición de los participantes de movilizarse se sugiere la exposición. En caso contrario la rotación resulta un importante ejercicio de validación. En ambos casos, los participantes al exponer los resultados se apropian del diagnóstico, refuerzan su seguridad se empoderan.

La búsqueda de satisfactores con o sin ejercicio de rotación tiene una duración aproximada de 2 y 3 hrs.

1.7 Construcción de matrices

Se introducen dos grandes matrices vacías. La facilitación solicita a los participantes que traspasen los satisfactores negativos a una matriz y los positivos a otra (escritos en papeles de color diferente). Esto se hace respetando el cuadrante de ser, tener, hacer, de cada necesidad. De manera dinámica y participativa en 15-20 minutos ambas matrices se completan y construyen manera simultánea.



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1.7 Reflexión

Con las dos matrices levantadas se logra la visualización conjunta como un diagnóstico logrado colectiva y participativamente. Se solicita a los participantes que se acerquen y observen de las matrices. En ese momento se abre un espacio de reflexión de los resultados desde los principios y fundamentos de la teoría de DEH con un lenguaje apropiado, pertinente y accesible al grupo de participantes. Se abre un espacio para compartir opiniones y reflexiones acerca del ejercicio y sus resultados. (duración aproximada 30 min.)

1.8 Escala gráfica

Se entrega a los participantes un instrumento para valorar la satisfacción de las necesidades de forma gráfica, y tomando en cuenta los resultados de las matrices. El instrumento permite valorar la satisfacción de cada necesidad de 1 a 100.

1.9 Cierre de la jornada

Se agradece la participación, y se despiden hasta la siguiente jornada.

2- Módulo 2: Síntesis y Evaluación

2.1 Preparación y limpieza de matrices

Es altamente recomendable que el equipo de investigación y facilitación revise los resultados de las matrices, y transcriba los post-it a una versión en computador. Esto permite mejorar la redacción y "limpiar" visualmente la matriz para continuar el trabajo.

2.2 Inicio de jornada y formación de grupos.

Se da la bienvenida a la jornada y si hubiese nuevos integrantes se presentan los objetivos de la investigación y del taller. Se sintetiza el proceso realizado en modulo anterior. Se forman dos grupos de trabajo y se ubican alrededor de mesas. (duración aprox. 20-30 min)

2.3 Selección de los satisfactores más importantes

A cada grupo se le entrega una de las matrices limpias y se les solicita la revisen seleccionen (subrayándolo) para cada uno de los casilleros un satisfactor más importante. Es posible que el satisfactor seleccionado se repita en varios casilleros, como también que haya casilleros que no tengan satisfactores seleccionados. Esto se hace mediante una activa conversación participativa donde los integrantes del grupo comparten su opiniones y las justifican y llegan a acuerdos para sintetizar la matriz. (duración aproximada 45 min.- 1 hr) Se invita a una pausa.

2.4 Construcción de una explicación

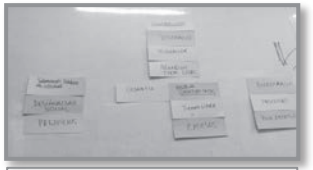
A continuación, se entregan al grupo tarjetas para que transcriban los satisfactores seleccionados. Se despeja la matriz y se solicita a los integrantes del grupo analizan las características de los satisfactores y sus relaciones. Se le solicita que les den un orden y explicación de las relaciones entre estos si las hubiese.

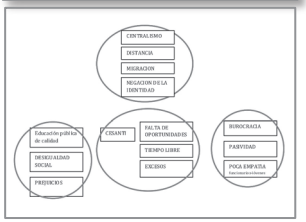
En este momento es posible introducir categorías de análisis como la propuesta por Max-Neef et. al. (1986) en satisfactores inhibidores, obstructores, pseudo-satisfactores, individuales o sinérgicos. Sin embargo, también es posible que las categorías para agrupar y comprender los satisfactores seleccionados emergen de la conversación y el análisis del grupo. Así por ejemplo los grupos sueles agrupar satisfactores que externos (con menor nivel de control) contextuales (que superan la comunidad) internos (propios del grupo) individuales, colectivos, relativos a ámbitos. Etc.

Una vez ordenadas las tarjetas se cuelgan en la pared o una pizarra y si es necesario se toma una pausa. (duración aproximada 45 min. 1 hr)

2.5 Plenario

Uno o más representantes de cada uno de los grupos expone en plenario los resultados de las matrices. Se abre un espacio para comentarios.





A modo de ejemplo, en un taller con jóvenes de comunas rurales del sur de Chile, el grupo seleccionó 14 satisfactores (síntesis) de los 36 casilleros de matriz negativa y construyeron la siguiente explicación. ¿Qué impide la satisfacción de las NHF de los jóvenes de comunas rurales? Agruparon en la parte superior lo que ellos definieron como condiciones estructurales adversas par alas comunas rurales: centralismo, distancia, migración interna, negación de la identidad local. Un segundo grupo de tarjetas ubicadas a la izquierda los definieron como condiciones de inequidad social: falta de educación de calidad, inequidad y prejuicios. En la derecha un tercer grupo con las condiciones institucionales que impiden la satisfacción de las NHF: burocracia, poca empatía de los servicios públicos, y pasividad. En el centro, ubicaron los satisfactores que el grupo acordó como validos para los jóvenes de todas las comunas: desempleo, falta de oportunidades, tiempo libre mal ocupado y excesos.

se solicita a los participantes que de manera individual definan 5 (estrategias-acciones) formas de superación del diagnostico negativo y fortalecer el diagnostico positivo. Esto puede hacerse de manera oral, anotando las opiniones en el pizarrón durante el plenario o aplicando un cuestionario que puede ser analizado posteriormente.

2.6 Cierre

Se agradece la participación, y se despiden hasta la siguiente jornada.

3- Modulo 3: Planificación para la acción

Este modulo es posible realizarlo forma continuada al modulo anterior, o espaciado con los mismo participantes o incluyendo otros.

3.1 Presentación del trabajo previo y formación de grupos

Los facilitadores resumen los procesos anteriores, y los resultados de las matrices, el diagnóstico negativo y deseado. Se forman grupos de trabajo. (duración aprox. 1 hr)

3.2 Satisfactores puentes

Se pide a los participantes que identifiquen los principales satisfactores sinérgicos presentes en el grupo objetivo (jóvenes de la comuna, adultos mayores, emprendedores). Se explica que la sinergia se relaciona con la capacidad de un satisfactor de satisfacer varias necesidades simultáneamente, de potenciar su satisfacción. Por otro lado los puentes significan que son posibles vías y caminos deseados. Acciones que llevar a cabo, valores guías, recursos (no en sentido material) y espacios y entornos donde las interacciones toman lugar.

Los facilitadores guían la conversación donde cada satisfactor se realiza con su potencial de satisfacción con las NHF. (duración de aprox. 1 hr)

3.3 Estrategias de acción

A continuación se propone que los grupos definan un conjunto de 5 a 10 estrategias posibles donde se utilicen esos satisfactores, y permitan superar los obstáculos para la satisfacción de las necesidades. Este ejercicio estimula la creatividad en la búsqueda de soluciones que permitan vincular los recursos (satisfactores positivos) existentes en el grupo (muchas veces no visualizados ni valorados) al servicio de superar obstáculos que inhiben la satisfacción de las NHF.

3.4 Jerarquización y priorización de estrategias

Sobre la base de los satisfactores sinérgico y las estrategias identificadas se solicita a los participantes que prioricen un máximo de 3. La priorización debe considerar los objetivos de la investigación, los recursos disponibles, el tiempo, la factibilidad entre otros.

3.5 Plenario y cierre del taller

Los grupos comparten y discuten sus resultados. La facilitación va registrando una lista de posibles vías y estrategias de acción que comparte con los participantes. Se cierra la jornada y el taller. Se entregan datos de contacto y se compromete la devolución y disponibilidad de los resultados del taller.

Spiering S and Barrera MdV (2020). How to?! Practical knowledge for transformative science — facilitation guidelines for two applications of the Human Scale Development approach. UFZ Discussion Papers, 3/2020. Leipzig: Helmholtz-Zentrum für Umweltforschung – UFZ, ISSN 1436-140X. https://doi.org/10.57699/a3y9-gd49

Spiering S and Barrera MdV (2020): How to?! Practical knowledge for transformative science — facilitation guidelines for two applications of the Human Scale Development approach. UFZ Discussion Papers, 3/2020. Leipzig: Helmholtz-Zentrum für Umweltforschung – UFZ, ISSN 1436-140X, https://doi.org/10.57699/a3y9-gd49

3.6 Consideraciones sobre el análisis

Dependiendo de la modalidad de registro y la calidad de los datos transcritos y recolectados durante las conversaciones grupales y los plenarios es posible generar material textual susceptible de ser analizado y validado en software de contenidos

Se elabora un informe con los resultados y análisis del taller. Estos resultados pueden ser la base para la construcción de hipótesis de investigación, la elaboración de otros instrumentos de recolección complementarios, y dar lugar a intervención de investigación acción y proyectos que impliquen mayor involucramiento con procesos de transformación social.

Appendix A.3

Masson T, **Centgraf S** and Rauschmayer F (2015): Mitglieder-Zuwachspotenzial für Energiegenossenschaften in Deutschland? Zeitschrift für das gesamte Genossenschaftswesen 65, 191–208. https://doi.org/doi:10.1515/zfgg-2015-0304

Masson T, Centgraf S and Rauschmayer F (2015): Mitglieder-Zuwachspotenzial für Energiegenossenschaften in Deutschland? Zeitschrift für das gesamte Genossenschaftswesen 65, 191-208.
https://doi.org/doi:10.1515/zfgg-2015-0304 | *Reproduced with kind permission from De Gruyter Oldenbourg*

Mitglieder-Zuwachspotenzial für Energiegenossenschaften in Deutschland

Torsten Masson
Salina Centgraf
Felix Rauschmayer
Romy Simke*

Zusammenfassung
Die deutsche Bevölkerung steht Energiegenossenschaften (EG) positiv gegenüber und schreibt ihnen erhebliche Potentiale zur Unterstützung der Energiewende zu. Dies konnte in einer repräsentativen Fragebogenstudie von Nichtmitgliedern erhoben werden. Finanzielle Motive scheinen für ein Engagement in EG keine überragende Rolle zu spielen. Als mögliche Gründe für einen EG-Beitritt schneiden der Umweltschutz, die Sicherung der Energiepreise sowie die Beteiligung der Bürger an der Energiewende am besten ab.

Summary
The german population has a generally positive attitude towards energy cooperatives (EG) and imputes a significant potential for the support of the energy transition to the young protagonists in the German energy landscape. This arose in a questionnaire-based survey on non-members. The safety of the investment and the level of return seem to be mostly irrelevant for the commitment in energy cooperatives. Environment protection, stability of energy prices and the participation of citizens in the energy transition are the most important reasons for joining an EG.

Résumé
La population allemande a une attitude positive envers les coopératives d'énergie et leur reconnaît un fort potentiel concernant le soutien apporté à la transition énergétique. Ceci ressort d'une étude représentative de questionnaires établie auprès de personnes non-membres. Des motifs financiers ne semblent pas jouer un rôle prépondérant pour un engagement en faveur des coopératives d'énergie. Sont données principalement comme raisons possibles pour une adhésion aux coopératives d'énergie : la protection de l'environnement, la sécurité des prix de l'énergie ainsi que la participation des citoyens à la transition énergétique.

* Dipl.-Kfm. (FH) Torsten Masson und Dipl.-Geogr. Salina Centgraf arbeiten als wissenschaftliche Mitarbeiter am Helmholtz Zentrum für Umweltforschung in Leipzig, Dr. Felix Rauschmayer leitet dort das Department Umweltpoltik und Romy Simke war dort wissenschaftliche Hilfskraft.

ZfgG 65,3, S. 191 – 208, © Lucius & Lucius, Stuttgart 2015

Appendix A.4

Centgraf S (2018a): Supporting civic engagement in German energy cooperatives — Transdisciplinary research based on the reflection of individual needs. Energy Research & Social Science 44, 10/2018, 112–121. https://doi.org/10.1016/j.erss.2018.05.003

Energy Research & Social Science 44 (2018) 112–121

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Original research article

Supporting civic engagement in German energy cooperatives – Transdisciplinary research based on the reflection of individual needs

Salina Centgraf

Department of Environmental Politics, Helmholtz Centre for Environmental Research – UFZ, Permoserstraße 15, D-04318 Leipzig, Germany

ARTICLE INFO

Keywords:
Energy transition
Human Scale Development Approach
Energy cooperatives
Transdisciplinary research

ABSTRACT

Civic engagement is currently playing a major role in the transformation of European energy systems. In Germany, citizen-driven renewable energy cooperatives (RECs) are often presented as pioneers of change and as models for the development of energy initiatives within Europe. Current research on RECs focuses mainly on entrepreneurial adaptations and innovations; what is generally missing from the research, however, is a detailed consideration of the human dimensions of this engagement. In view of this, the present paper proposes applying the needs-oriented Human Scale Development Approach (HSDA) as a means of supporting civic engagement within a transdisciplinary research framework. It is argued that the needs perspective can be helpful in developing new strategies that support initiatives in their objective to remain stable and robust over the long term. The empirical part of the paper presents three case studies of German RECs which (1) explore the challenges encountered by active members in their everyday organizational efforts, (2) describe the potential benefits from their involvement, and (3) identify factors that encourage civic engagement. The results indicate that the challenges are inhibiting factors which not only jeopardize the groups' shared objectives but also adversely influence the emotional well-being of those who are actively involved.

Appendix A.5

Spiering S (2022): Self-reflexive practice through the Human Scale Development approach — competencies needed for transformative science research. Special Issue on: "Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work". International Journal of Sustainable Development [online first] https://doi.org/10.1504/IJSD.2022.10049718

Spiering S (2022) Self-reflexive practice through the Human Scale Development approach — competencies needed for transformative science research. Special Issue on: "Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work". International Journal of Sustainable Development, Vol. 25, Nos. 1/2, 2022. https://doi.org/10.1504/IJSD.2022.10049718 | *Reproduced with kind permission from Inderscience*

Self-reflexive practice through the human scale development approach – competencies needed for transformative science research

Salina Spiering

Helmholtz Centre for Environmental Research GmbH – UFZ,
Permoserstraße 15,
04318 Leipzig, Germany
Email: salina.spiering@ufz.de

Abstract: Solution-oriented transformative science (TSc) is increasingly being discussed as a means to produce participatory and actionable knowledge for sustainability transitions. This requires that researchers adopt different roles, competencies and a degree of reflexivity, which thus far, are often not fully applied. This article proposes the human scale development approach (HSDA) of the Chilean economist, Max-Neef and his colleagues, as a valuable framework to engage in self-reflexive research practices. Inspired by autoethnography, I draw on my own sustainability research as a PhD-student, paying close attention to deprivations, potentials that I encountered, exploring how self-reflexive practices enhance the understanding of competencies and elucidating how to adopt and fulfil required research roles and procedures. I show how such a self-reflexive process can be a useful (training) tool not only for early PhD researchers and for supervision, but may add value for TSc scholars in general.

Keywords: autoethnography; transformative science; TSc; self-reflexive practice; human scale development approach; HSDA; roles of researcher; competencies; values; reflexivity; sustainability science.

Reference to this paper should be made as follows: Spiering, S. (2022) 'Self-reflexive practice through the human scale development approach – competencies needed for transformative science research', *Int. J. Sustainable Development*, Vol. 25, Nos. 1/2, pp.132–159.

Biographical notes: Salina Spiering, née Centgraf, is a researcher at the Department of Environmental Politics at the Helmholtz Centre for Environmental Research – UFZ. She is a geographer by training (with a diploma from the University of Leipzig) and a PhD student in the Department of Geography at the University of Münster (WWU). Her research interests involve biodiversity policy, methods for transformative change, transformative science, conflict transformation, narratives, and the support of sustainable agri-food-systems.

Spiering S (2022) Self-reflexive practice through the Human Scale Development approach — competencies needed for transformative science research. Special Issue on: "Manfred Max-Neef's Contributions to Theory, Methods and Practice in Sustainable Development: Applications of his Work". International Journal of Sustainable Development, Vol. 25, Nos. 1/2, 2022. https://doi.org/10.1504/IJSD.2022.10049718 | *Reproduced with kind permission from Inderscience*

1 How and why is a self-reflexive practice valuable for transformative science scholars?

With climate change and biodiversity loss, humanity faces a sustainability crisis on an unprecedented scale. In response to these pressing challenges, transformative approaches are increasingly seen as promising options to facilitate the necessary sustainability transformations. Transformation-oriented transdisciplinary research and transformative science (TSc) aim at producing actionable knowledge, thereby catalysing transformative changes towards sustainability following the agenda 2030 as its normative compass (Schneider et al., 2019). This also implies changes in the roles that researchers adopt. These roles, but also the competencies and skills that TSc scholars need, differ heavily from that of 'conventional' researchers and are increasingly under scrutiny (Wittmayer and Schäpke, 2014; Adelle et al., 2019; Bulten et al., 2021). Within an ongoing endeavour to evaluate the quality of TSc methods, one aspect that is repeatedly emphasised is the need for reflexivity (Popa et al., 2015; Fazey et al., 2018). Reflexivity entails two dimensions: First, approaches for transformation-oriented transdisciplinarity/TSc need to be reflexive. In a previous publication together with a colleague, I presented the human scale development approach (HSDA) of the Chilean economist, (Max-Neef et al., 1991), as a reflexive approach based on its unique reflection of human needs (Spiering and Barrera, 2021). Secondly, the personalities of the researchers with their normative assumptions, values, backgrounds, intentions and the roles they adopt need to be considered using (self-) reflexive practices. It is assumed that given all of these dimensions, TSc scholars influence the research they undertake. So far, within sustainability science, few reflexive approaches have been presented that may be suitable for undertaking self-reflexive practices (Lipp, 2007; Van Mierlo et al., 2010; Horlings et al., 2020). Although there is this manifold claim for reflexivity, little is known on how to undertake a valuable self-reflexive practice (Popa et al., 2015). A meaningful self-reflexive practice has to enable TSc scholars to explicate their responsibilities and accountabilities and to shed light on their needs for support while fulfilling their very demanding tasks.

Within this paper, I will focus on the self-reflexive practice of TSc researchers. I aimed to understand the competencies that promote TSc scholars in adopting different roles. Thus, this work is inspired by autoethnographical sensibility and deals with my personal experience in undertaking empirical research using insights from ten HSDA workshops that I undertook in Chile and Germany. As a TSc scholar, I became a significant part of the research in the way I interacted, represented science and related to the research participants. As such, I acknowledge subjectivity, emotionality and my [direct] influence on the research results. I use my personal experience to illustrate challenges and potentials that other TSc scholars may also face and, in so doing, make characteristics of TSc research better known to insiders and outsiders. Thereby, I aim at contributing to the discussion on competences and training needed especially for transdisciplinary TSc research (also in higher education).

My main research question is: how can TSc scholars – whose research is situated between science and fields of action – undertake a self-reflexive practice within their research? This entails the following sub-questions: which frameworks support TSc scholars in undertaking a self-reflexive practice? Which competencies do TSc scholars acquire and improve themselves during their research? What is the added value of the

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self-reflexive process for the researchers, their respective research and research in general?

I propose the HSDA as a valuable tool to undertake self-reflexive practice, in general. Further, I argue that it is a valuable approach for reflexive TSc research (Spiering and Barrera, 2021) and for the self-reflexive practice of TSc scholars.

First, I show on a theoretical level, why (self-)reflexivity is perceived as being important for TSc research and how an autoethnographic sensibility can inform TSc self-reflexive practice. I present different roles of TSc researchers and respective skills and competencies. Secondly, I present a brief overview of the HSDA, arguing that it serves as a valuable tool for self-reflexive practice. Thirdly, I undertake the self-reflexive practice concerning deprivations and potentials that I faced within my research. In the discussion, I point out the implications of applying the HSDA as a tool for self-reflexive practice for TSc scholars and conclude by showing the value added by applying it.

2 Self-reflexive practice on competencies through the lens of HSDA

2.1 Self-reflexive practice within TSc

2.1.1 TSc and the need for reflexivity

TSc aims at contributing to sustainability transformations, is committed to the 2030 agenda as its normative compass and applies transdisciplinary methods (Scholz, 2017). It follows three main goals: creating scientific/conceptual knowledge, catalysing change/creating actionable knowledge and following educational goals (Beecroft et al., 2018, Spiering and Barrera, 2021). TSc is driven by human values, thereby challenging the predominant understanding and foundation of modern science as being objective and value-abstinent (Ziegler and Ott, 2011; Martin, 2015; Schneidewind, 2015; Messerli et al., 2019; Fazey et al., 2020). The research processes within TSc are characterised by practical relevance/solution-orientation, democratic co-production of knowledge and values, deliberation, normativity and learning – all mutually with societal actors (Jaeger-Erben et al., 2018; Schneider et al., 2019).

To guarantee the quality of transformative transdisciplinary research, reflexivity is one of the crucial criteria widely proposed (Wittmayer et al., 2018; Fazey et al., 2018; Sharpe et al., 2016; Defila and DiGiulio, 2019). It is in contrast to the concept of reflection, which is traditionally defined as "a mirror image – an objectivist ontology based on the idea that there is an original reality we can think about and separate ourselves from" [Cunliffe and Jun, (2005), p.226] and that encompasses a collective process where learning from experiences is linked to understanding of past action and to improvement in future action [Pässilä et al., (2015), p.69; Vince and Reynolds, 2009]. Instead, reflexivity goes further, based on the idea that the meanings of our worlds and ourselves are continuously constructed (Pässilä et al., 2015). Reflexivity is "grounded in constructionist and deconstructionist views of the world" [Pässilä et al., (2015), p.70], is characterised as dialogic and relational activity and means unsettling conventional practices (Cunliffe and Easterby-Smith, 2017) by questioning one's taken-for-granted assumptions (Pässilä et al., 2015). It is, therefore, a "deeper learning process to the relatively superficial act of reflection" [Fazey et al., (2018), p.66].

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One main challenge of TSc is to integrate certain forms of reflexivity regarding intentional and unintentional results of the research processes [Wittmayer, (2018), p.93]. On the one hand, research processes need to be critically reflected due to the need for transparency and legitimacy. On the other hand, the influence of TSc researchers on 'their' research processes and outcomes is increasingly under observation (Avelino, 2011; Van der Hel, 2018; Bulten et al., 2021). Even though the claim for self-reflexive practice is not new (Schon, 1984), the prevalent transdisciplinary sustainability discourse lacks a clarification of the concept of reflexivity: "in the absence of such a clarification, transdisciplinarity risks being reduced to formal consultation (to validate a pre-existing technocratic or ideological agenda) or becoming politicised at the expense of scientific soundness and reliability" [Popa et al., (2015), p.14]. Thus, careful reflexive practice in regard to epistemological assumptions and normative positioning held by TSc scholars is needed to contribute to transparency and accountability of TSc research (Wittmayer et al., 2018). Disclosing the values underlying one's research assures an appropriate relation between research and values and avoids "the risk of being instrumentalised by dominant actors or to blindly execute power without realising it" [Schneider et al., (2019), p.1601]. Herweg et al. (2017) proposed to integrate reflexive practice as part of scholarly activities, including university teaching and project work. Other scholars propose to include ethicists for thorough theoretical articulation of these questions into large sustainability projects, as they might stimulate deep questions (Ziegler and Ott, 2011).

2.1.2 Autoethnography inspires self-reflexive practice within TSc

I argue that self-reflexive practice processes within TSc may be enriched by autoethnographical approaches. These have a long-standing reflexive tradition within social sciences (Ellis and Bochner, 2000; Butz, 2010) even though they – very similar to TSc research – reject the deep-rooted binary concept of objectivity and of being value-free (Ellingson and Ellis, 2008). Thus, autoethnography is a critical response "to the alienating effects on both researchers and audiences of impersonal, passionless, abstract claims of truth generated by such research practices and clothed in exclusionary scientific discourse" [Ellingson and Ellis, (2008), p.450]. Analogously, Van der Hel et al. (2018, p.249) demand for solution-oriented sustainability researchers to "'step out of their academic comfort zone' of objectivity and independence".

Butz (2010, p.139) pleads for an 'autoethnographic sensibility' that he understands not as methodology or set of methods, but as epistemological orientation to the relationships among experience, knowledge and representation with a variety of methodological implications. Autoethnography as the 'study of one's own humanity' (Scott, 2019) is the intent to undertake a self-reflexive practice by having a closer look at personal (familiar) experiences from a distance by changing perspectives. Understanding occurs when the autoethnographer locates the 'self' in the social context and links the personal experience with culture (Alsop, 2002). In this case, it is the 'culture' of doing TSc research. Thereby, the autoethnographer embraces and foregrounds her subjectivity and emotionality rather than subduing or deactivating it. She acknowledges her (direct) influence on research and provides descriptions and critique of cultural beliefs, practices, values, politics and positions (Alvesson and Sköldberg, 2009). Being reflexive on the researcher's positionality includes exploring her relationship with the object of research (Harding, 1989). This makes the research understandable (Harding, 1989) and her engagement in a self-referential analysis gives context on how her biography, place and

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the positioning of self and the other shape the research process (Day, 2012; Gergen and Gergen, 2000).

Gram-Hanssen et al. (2022, p.679) argue for a self-reflexive practice to 'uncover blind spots, question assumptions and allow oneself to be affected, even transformed, in the process of engaging with the world'. Alsop (2002) argues for the importance of self-reflexive practice with the analogy of a psychotherapist: psychotherapists need to understand the relations between their own (childhood) experiences and their behaviour to have integrated their own fears, motives, resistances and relationship patterns, to be able to support and accompany their clients in their self-reflexive practice. Adapting and applying this to TSc scholars, it is crucial to understand and make the motives and underlying needs of TSc scholars explicit when engaging in transformative change. Doing this includes self-reflexive practice on the states of mind, positions of power or ways of producing knowledge, as an interplay between the stakeholders within the scope of her research and herself. Thus, self-reflexive practice is essential in the research process to understand the social practices of all those involved.

When practically applied, reflexivity is a skill and capacity that requires practice, training and being inclined to apply it on a regular basis [Fazey et al., (2018), p.57]. Reflexivity involves scrutinising aspects usually taken for granted and that seem to be self-evident. The self-reflexive practice allows the researcher to understand herself as part of the dynamics that she is aiming to change and supports her in a number of aspects [Wittmayer et al., (2018), p.9]:

- situating and positioning him/herself in the research
- exploring the researcher-researched relationship and the co-constitution of research
- offering social critique and deconstructions of established meanings
- introspection:
  1 a positioning of oneself as a researcher in time and space
  2 regarding one's background
  3 normative orientation
  4 questioning the ways in which the researcher shapes the research and vice versa
- critical reflection on the situatedness of the research, the social context and political dimensions
- possible unintended effects.

Several risks, challenges and concerns go along with self-reflexive practice both on a systemic/professional and personal level such as missing or confusing the dialectics of the personal and the cultural (Alsop, 2002), career risks (Milkoreit et al., 2015) and the concern 'that the credibility and authority of science could be undermined by its direct engagement with value-laden discussions and political debates' [Van der Hel et al., (2018), p.249].

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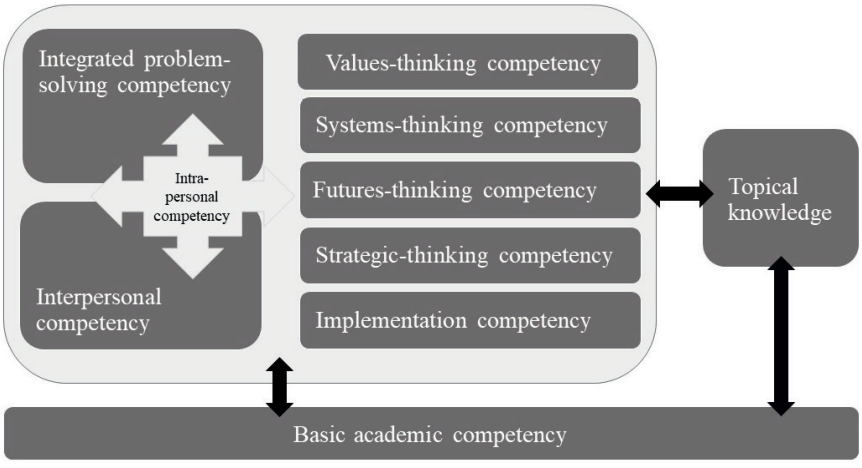
2.2 Different roles and competencies of TSc researchers

> "Scientists are used to multiple, often conflicting roles, but often lack the time and training to reflect on what they are doing. This may result in contradictions they have difficult[ies] coping with or end in sheer frustration. Again, it's important within research institutions to create spaces where such tensions can be made visible and guidance towards self-reflection can be offered." [Nowotny, (2018), p.7]

Within participatory action research (Heen, 2005; Burgess, 2006), feminist research (Oakley, 1981; Fonow and Cook, 1991; England, 1994) and autoethnography (Lac 2018), it is common practice to discuss the roles of the researchers in particular. Within TSc, it is increasingly recognised that the range of tasks for TSc scholars expands and they need to adopt different roles throughout the research process (Wittmayer and Schäpke, 2014; Hilger et al., 2018; Horlings et al., 2020). Still there is a pressing need to emphasise the potentials and value of the different roles, how academics choose to adopt certain roles, which skills and competences they need to "become effective 'change agents', transition managers, problem solvers, and effective performers" [Salgado et al., (2018), p.164] and what problems they face in doing so (Horlings et al., 2020; Bulten et al., 2021). Wittmayer and Schäpke (2014) presented a highly regarded framework to assess these different roles of researchers within transformation research:

1 reflective scientist
2 facilitator
3 change agent
4 (self-)reflexive scientist.

Figure 1 Framework of key competencies in sustainability



Source: Adapted from Brundiers et al. (2021)

Table 1 Extended description of competencies in the framework of key competencies in sustainability

Integrated problem-solving competency	• Successfully integrate two or more of the key competencies in sustainability problem-solving endeavours • Integrate all key competencies to create viable and equitable solutions for sustainability • Select and apply appropriate problem-solving frameworks
Interpersonal competency	• Apply the concepts and methods of each competency not merely as 'technical skills', but in ways that truly engage and motivate diverse stakeholders and to empathically work with collaborators and citizens' different ways of knowing and communicating • Include different types of collaboration, from small to large interdisciplinary teams, stakeholder engagements as well as transdisciplinary and action research methods; this reinforces the emphasis that each competency requires collective efforts and highlights the wider set of professional skills, such as communication and deliberation, project-management, lifelong-learning, and leadership reflecting recent literature
Intrapersonal competency or self-awareness competency Similar to interpersonal competency, intrapersonal competency underpins all other competencies.	• Be aware of one's own emotions, desires, thoughts, behaviours and personality • To regulate, motivate, and continually improve oneself drawing on competencies related to emotional intelligence and social and emotional learning • UNESCO's (2017, p.10) key competencies for sustainability, which define 'self-awareness competency' in relation to context – 'reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires'
Values-thinking competency Provides the normative orientation for all the other competencies (it thus stands on top of the hierarchy of competencies): values-thinking competency and sustainability values need to be the main reference point for the other competencies.	• Differentiate between intrinsic and extrinsic values in the social and natural world; identify and clarify one's own values • Explain how values are contextually, culturally, and historically reinforced • Recognise normalised oppressive structures; critically evaluate how particular stated values align with agreed-upon sustainability
Systems-thinking competency	• "Collectively analyze complex systems across different domains (society, environment, economy, etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features related to sustainability issues and sustainability problem-solving frameworks."

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Table 1 Extended description of competencies in the framework of key competencies in sustainability (continued)

Futures-thinking competency	• "Iterate and continuously refine one's own futures thinking (visions, scenarios, etc.), in productive and explicit tension vis-à-vis the status quo" • Recognise the 'implicitly held (and largely unrecognised) assumptions about how society works' and how they influence the status quo • Critically reflect how they might influence futures thinking
Strategic-thinking competency	• Recognise the historical roots and embedded resilience of deliberate and unintended unsustainability and the barriers to change • Creatively plan innovative experiments to test strategies • Engage in and lead radical change, using concepts of transgression and disruption
Implementation competency • Its hands-on orientation distinguishes it from integrated problem-solving competency. • It catalyses the cognitively driven integrated problem-solving competency into manifest changes on the ground. • It is thus a primary motivation for conducting sustainability research.	Implementation competency is essentially action competency, using actionable knowledge that has been created through strategic-thinking competency. It is a competency explicitly about taking action: the ability to act, or to consciously implement interventions, was identified as a highly important competency for sustainability by student teachers […] and sustainability professionals. It is the collective ability to: • Implement a planned solution toward a sustainability-informed vision, to monitor and evaluate the realisation process, and to address emerging challenges (adjustments), recognising that sustainability problem-solving is a long-term, iterative process between planning, realisation, and evaluation • Disrupt and transgress to break habits and dominant and hegemonic structures and lead radical change
Topical knowledge and basic academic competency	• Recognise different approaches to theory building (e.g., social constructivism, critical theory)
Competency underpinning key competencies in any degree programme	• Acquire basic research competencies to enable evidence-based decision making, including conducting an interdisciplinary literature review • Critical thinking, being an important part of basic academic competency, is "the ability to question norms, practices and opinions; to reflect on one's own values, perceptions and actions; and to take a position in the sustainability discourse" [UNESCO, (2018), p.12]

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Brundiers et al. (2021) presented a consolidated framework of key competencies "to enable and empower students to become effective in positively contributing to sustainability problem-solving in their lives, professions, and communities". The framework consists of clusters of related 'key competencies in sustainability' that are interdependent, such that each competency contributes its part to the sustainability problem-solving processes. This framework is perceived as being helpful for understanding the different competencies needed for adopting the different roles within sustainability research (Brundiers et al., 2021). I had this in mind, like a memo box, when undertaking my self-reflexive practice. I did not analyse every competency in detail but rather used the competency framework to later classify my experiences (cf. 5.1.1).

3 HSDA as tool for self-reflexive practice

3.1 HSDA in a nutshell – analytical framework for systematic self-reflexive practice

In this sub-chapter, I present the HSDA of the Chilean Economist, Max-Neef et al. (1990), as a valuable framework to undertake a self-reflexive practice, as it provides a unique evaluation framework based on human needs. The main endeavour of my research was to suggest and test the HSDA as a reflexive approach for conducting transdisciplinary TSc research (Centgraf, 2018; Spiering and Barrera, 2020, 2021). The HSDA proved to be a very suitable tool. Within this paper, I will go a step further and undertake the experiment to apply HSDA as a self-reflexive tool for assessing my own research journey.

Max-Neef et al. (1991) introduced the HSDA as a human-centred-approach, and thus an alternative to neo-classical approaches, to increase human well-being through the potential of meeting individual and societal needs with appropriate strategies. They provided a taxonomy of human needs as a theoretical concept and introduced a matrix of needs and satisfiers as a participatory tool to empower Latin American communities (Figure 2). In a deliberative reflection and evaluation process, communities can identify their potentials and deprivations according to the level of satisfaction of their needs. Therefore, Max-Neef et al. (1991, p.16) presented a list of human needs that they describe as few, finite and classifiable: subsistence, protection, affection, understanding, participation, idleness, creation, identity and freedom. Whereas the needs are assumed to be constant through all human cultures and across historical time periods, the means by which the needs are satisfied change over time and across cultures (ibid.). These so-called satisfiers are either the idea or realisation of how needs are to be implemented, depending on internal abilities (endogenous) and external circumstances (exogenous). The distinction between needs and satisfiers is a central notion of the HSDA: needs can be satisfied along the existential categories of being ('how am I/are we/not?'), having ('what do we/I have/not?'), doing ('what are we/am I doing/not?') and interacting (listing locations and milieus). Each need can be satisfied at different levels and with different intensities. Satisfiers can be classified as singular, synergic, destructive, inhibiting or as pseudo-satisfiers, according to the way in which they fulfil one or several needs. Jackson et al. (2004, p.12) go further and link needs fulfilment with emotions and feelings: they provide a categorisation of feelings according to the typology of needs and argue that the satisfaction of a need yields pleasant feelings, whereas the dissatisfaction of needs yields

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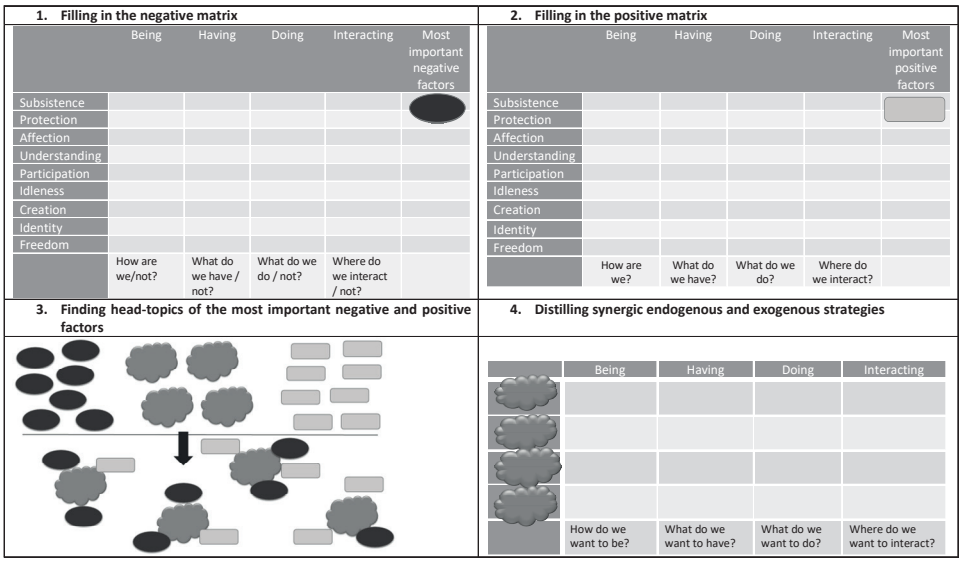
unpleasant feelings. Focusing on needs and linking satisfiers to needs "allow[s] for the discovery of unexpected facets of a problem, thus increasing awareness about what [is] relevant" [Max-Neef et al., (1991), p.43]. For further details regarding the HSDA methodology, see Spiering and Barrera (2020, 2021).

Figure 2 Introduction to HSDA – from matrix filling to distilling synergic endogenous and exogenous strategies



Source: Adapted from Spiering and Barrera (2020)

Within this paper, I follow suggested workshop-formats and retroactively and selectively fill in a so-called negative matrix [with all of the factors that impeded my needs realisation (deprivations)] and a positive matrix [with all the factors that supported my needs fulfilment (potentials)]. Then, I juxtapose all satisfiers and identify common topics to distil endogenous and exogenous strategies that may optimally contribute to my synergic needs' actualisation (Max-Neef et al., 1991; Guillen-Royo, 2016; Spiering and Barrera, 2020). Inspired by autoethnographic-sensibility, I assemble my experiences using hindsight and aim at emphasising the roles, competencies, challenges and supportive factors within my research journey.

3.2 The cases – insights from applying the HSDA in nine case studies

This self-reflexive piece is informed by a participatory TSc research process that I conducted between 2014 and 2020 as a graduate student in geography. To ground my current inquiry in the context of doing TSc research, I will exemplify the self-reflexive practice with vignettes from my experiences of engaging in ten HSDA workshops, four of which I conducted within the German research project EnGeno on German Energy Cooperatives (Lautermann et al., 2017).

Within a first EnGeno case study (2014–2016), HSDA workshops in three German energy cooperatives were conducted as a means of supporting the civic engagement of their members (Centgraf, 2018). A fourth workshop within the EnGeno project brought

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together three other German energy cooperatives from within one region and additionally a transition town initiative from the same area. The workshop aimed at supporting them in identifying deprivations, potentials and common strategies for citizen-driven renewable energy projects in their region.

Table 2 Cases in which I acted as reflective scientist, facilitator, change agent and (self-)reflexive scientist

Case study	*Participants*	*Aims and objectives*	*Process and role of HSDA*
Transformational potential of energy cooperatives EnGeno (2014–2016) (Centgraf, 2018)	Three workshops with members of the management and supervisory boards and active and passive members of three German energy cooperatives	To support the members of German energy cooperatives, whose involvement is mostly voluntary, to support initiatives that are robust in the long-run	Facilitating the development of new strategies which help the individual members of energy cooperatives to meet the challenges arising from their civic engagement
	One workshop with three regional energy cooperatives, a transition town initiative and political stakeholders	Networking of various actors to determine development strategies for renewable energy in the region	Identifying deprivations, potentials and common strategies for citizen-driven renewable energy projects
Transformation towards a program for renewables, Liceo Tecnico de Paillaco, Chile (2016)	One workshop with teachers and students of the Technical School of Paillaco in Chile	To support the bottom-up foundation of a program for renewable energy in the technical school	Identifying common strategies to establish a programme for renewable energy within the school
Strategy process to form an energy cooperative in Nalbach, Germany in cooperation with the BMBF-project Klima-Citoyen (Schweizer-Ries et al., 2016)	Three workshops with major, council members and citizens of the municipality of Nalbach, Germany	To undertake a comprehensive consultation on challenges and opportunities of forming an energy cooperative in the municipality of Nalbach	Facilitating the decision- making process for forming an energy cooperative, reflecting on the negative and utopian factors and strategies for implementation
Digital Workshops with HSD-master students of the Universidad Austral de Chile (2020, 2021)	Two workshops with seven HSD masters students	To reflect on being a master's student at UACh during the coronavirus pandemic	Two-fold aim: learn about how to facilitate an HSDA-workshop and increase the level of well-being of students within the master's programme

In collaboration with the German BMBF-project 'Klima-Citoyen', (Schweizer-Ries, et al. 2016) I conducted three workshops in a southern German community to facilitate the decision-making process on forming a communal energy cooperative in their municipality.

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A third case study took place in 2016 in Paillaco, Chile. It was conducted in collaboration with partners from the University Austral de Chile (UACh) and the Community Innovators Lab at the Massachusetts Institute of Technology, Boston (MIT CoLab). Together with master students of the UACh who co-facilitated the process, teachers and students of a Chilean technical school could be supported, in the bottom-up foundation of a programme for renewable energies at their school.

In a last case study, I conducted a workshop in two online sessions with HSD-master students of the UACh (2020). Between ten to thirty people participated in each of the ten workshops.

The self-reflexive practice is based on many sources: workshop discussions, observation protocols, research diaries and on semi-structured interviews that I conducted within the case studies. As the research process was constantly reflected, the methodological steps of my application of the HSDA were 'polished' iteratively throughout my research journey and are outlined in Spiering and Barrera (2020, 2021).

4 Learnings from the cases: stocktaking of deprivations and potentials within my TSc research project

4.1 My normative positioning and important values guiding action

As a first step of my autoethnographic-sensible endeavour, I reflect myself as to where I stand regarding values and how I got there.

After a first semester in ethnography, I decided to study geography and political sciences as I perceived these fields to be more application-oriented. I was fascinated by the special perspective of geography to link natural sciences and social sciences and I was convinced that only this holistic understanding could contribute to addressing 'wicked' or 'super-wicked' sustainability problems. In an internship on an Argentinian ecovillage, I joined an Ecovillage Design education course in which for the first time, I came into contact with non-violent communication as a needs-based approach to increase personal well-being. I perceived this as a highly valuable tool that revolutionised my communication. After graduating, I started to work as fundraiser for the German non-governmental organisation 'Friends of the Earth International' and understood myself as political activist. Convincing other citizens in the pedestrian areas or even at their front doors to become member of an environmental organisation was a meaningful, although sometimes a frustrating endeavour. Out of personal motives, I took the training to be a mediator and later trained mediators myself with a focus on diversity – and needs-based-communication. Driven by the longing to develop myself further, I headed back into the science domain, with the opportunity to do a PhD on the transformative potential of German energy cooperatives, within the Department of Environmental Politics at an international centre for environmental research.

I would like to add another dimension of my personal background to this chapter concerning my positionality (see Section 2.1.2). With regard to research roles, not all of them can be put on and taken off in the cloakroom, but are in part closely interwoven with one's own background and identity – the social self (Coffey, 1999). Accordingly, this dimension is an elementary component of self-reflexive research practice.

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> "Therefore, I draw on my very personal background in relation to my identity as scientist: growing up in a working-class family, I struggled with the fears and devaluations of my parents – my mother, who usually felt too stupid for everything, and my father, who wanted to keep me from not being good enough. As the first child at high school, contrary to my father's wishes, who wanted to see me at secondary school to save me from disappointment, from then on, I had the task of proving 'that I could'."

> "Within the research project on energy cooperatives, I was never very much interested in the technical aspects of the energy transition but more in the questions on how to promote transformative change of the energy system from the ground. With the background of an activist, I struggled to find my position within academia and basically clinged to qualitative research. Still, I felt I would have liked to engage even more in a normative solution-oriented approach, although difficult when surrounded by mostly descriptive-analytical colleagues who were sceptical of or even reluctant to consider, let alone accept, approaches like participatory action research. Still feeling somewhat like an alien but at last having found a community within literature, I now define my research as research within TSc at the interface between science and practice. Still, this reminded me of the struggles I faced during infancy – being a working-class child and the first one in the family at university; there it was again – the necessity of, and at the same time the horror and helplessness when entering unknown territory, being a pioneer without someone to guide me. The inner doubts took control – am I good enough for science? Am I intelligent and smart enough? Do I have sufficient skills? Is that real science? Do I harm the reputation of science by adopting normative standpoints and actively promoting change?"

Undertaking a self-reflexive practice, I was able to uncover, make explicit and integrate the connections between my personal origins and my roles as a TSc scholar.

4.2 Deprivations and potentials

In Table 3, I collected all obstacles to meeting my needs which were linked to negative (destructive or pseudo) satisfiers. In Table 4, I collected all factors which were linked to positive (singular or synergic) satisfiers.

After juxtaposing these factors, I identified the four main sub-categories to describe potentials and deprivations during my research journey.

4.2.1 Academic environment

The main obstacles to meeting my needs, with respect to the academic environment I was involved in, are linked to negative satisfiers such as a lack of a working group within which I could have reflected on my research on a regular basis, colleagues in working groups that rejected value-laden, normative and solution-oriented approaches and a graduate school that focussed on the formation of natural scientists conducting quantitative research, where the needs of TSc researchers have not yet been acknowledged. Further, a strong hierarchical system within the research institute, in which I experienced the behaviour of one of my supervisors as devaluation that affected my needs for freedom, identity and creativity negatively. This resonated gravely with internal criticism that already doubted my right to belong to the 'sphere of real scientists.'

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Table 3 Collection of all negative satisfiers that impeded my needs fulfilment

	Being	*Having*	*Doing*	*Interacting*
Subsistence				
Protection	• Competency in different areas but never 'real' expert (all-round dilettante)	• Pressure of doing 'excellent' research • *Lack of resources to understand power relations within the 'fields'* • Having not integrated participants in X right from the beginning	• *Doubting thoughts – 'Am I good enough? Is this research scientific enough?'* • Unsecure if I selected 'the right' interview partners – not understanding power relations because of one-off-workshops	
Affection				• Competition culture
Understanding		• At the beginning of the thesis, difficulties to find literature on HSDA-applications	• Challenge to conduct workshops in Spanish language	• *Graduate school that focused on the formation of quantitative natural scientists (neglecting the needs of qualitative social scientists or even TSc scholars)*
Participation	• When alone with my research, I become more passive and silent when I feel insecure	• *Lack of good supervision* • Lack of 'technical knowledge' • Lack of time/resources to deepen the collaboration with the workshop participants.	• Regular reflections within a research team • Lack of a daily working group within which I could reflect my research • Struggle with theoretical knowledge	• *Colleagues that extensively criticise or do not value transformative research* • *Internalised classism 'you do not belong to this group'*
Idleness		• *High effort to take responsibility for the workshop processes*		
Creation		• *Feelings of devaluation by supervisor's behaviour* • Lack of time for the PhD while working as part-time researcher	• Although sufficient English proficiency, difficulties in expressing myself/writing in English	• *Research culture where excellence is a main driver and failure or experiments are less valuable* • Doubts of supervisor if HSDA is the right tool
Identity	• *Intimidated as young female scholar within a field of retired male academics (in the workshops with the energy cooperatives)*	• lacking theoretical knowledge	• *Doubting my abilities as a 'real scientist'*	
Freedom				
	How am I/not?	*What do I have/not?*	*What do I do/not?*	*Where do I interact/not?*

Source: Building on the categories suggested by Max-Neef et al. (1990)

Table 4 Collection of all positive satisfiers that supported my needs fulfilment

	Being	*Having*	*Doing*	*Interacting*
Subsistence		• Financial support of the FES grant	• *Strong desire to contribute to agenda 2030/sustainable development*	
Protection		• Experimental character announced in advance	• *Ability to create safe spaces and create trust*	
Affection	• Openness • Being fully present with the whole body (trained in yoga and meditation)	• *Capacity for active/deep listening and reformulation* • Organisational skills • Surprise of the participants to be heard at eye-level	• *Joy about having initiated a process of reflection* • *Eating cake and singing birthday songs together* • Encounter others as humans with needs (interest in their driving motivations and values)	• Joy, happiness and hope in the vision phase
Understanding	• Openness, interested, curiosity • Assertiveness (HSDA instead of Capability Approach because it is more practically applicable)	• Courage to emphasise process-orientation (instead of output-orientation)	• *Learning from experiences – adapting the methodology throughout the process*	• *Participants who allow themselves to reflect on their needs* • Having a supervisor who supported me in publishing my work
Participation	• Flexibility	• *Contact and exchange with other HSDA scholars*	• *Embodied interventions instead of mere intellectual interventions*	
Idleness			• *Letting go and being able to trust the process*	• *Openness and willingness of cooperatives and responsible actors to promote workshops*
Creation	• Creativity • *Openness for experimentation* • Motivation	• Value tacit knowledge • Enabling embodied experiences and exercises in the room • *Getting to know, 'father' of HSDA, Manfred Max-Neef, in person*	• Acknowledge failure as option • *Support master's students and colleagues on how to facilitate HSDA processes*	
Identity		• Ability to deal with resistances	• *Trained as a mediator and facilitator* • Accompanied by a professional coach	
Freedom		• Financial resources from research project and research institute (e.g., for language editing, conference fees, open access publication, etc.) • A university supervisor who extensively supported me	• *Clear setting and communication of boundaries of interactions*	
	How am I?	*What do I have?*	*What do I do?*	*Where do I interact?*

Source: Building on the categories suggested by Max-Neef et al. (1990)

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On the other hand, the academic environment enabled me to meet my need for subsistence, as I could contribute to sustainable development by supporting energy cooperatives' members in their endeavours. As part of the workshop with master's students in Chile and in a workshop with colleagues from the University of Vienna, I was able to train others to implement the HSDA themselves, which contributed to the realisation of my needs for creation and participation.

4.2.2 Tools and resources

With respect to obstacles concerning tools and resources, I linked negative satisfiers such as a lack of resources and time to meeting my needs for protection and understanding. Due to these shortcomings, I conducted one-off workshops and thus, was not convinced to understand the power relations among the workshop participants sufficiently. In one case, this resulted in uncertainties as I had the impression that not all negative factors were mentioned due to a difficulty of participants to criticise and question hierarchies.

On the other hand, I could profit from setting clear boundaries and communicated the limits of the workshops/interventions to address different expectations in advance. This clarification very much contributed to meet my needs for freedom and idleness.

4.2.3 Abilities and competencies

I identified factors that impeded my needs realisation with respect to abilities and competencies, such as the high effort to take responsibility for the workshop processes which impeded my needs for protection and idleness. The internal doubt which made me question my competencies to undertake 'real' scientific research highly affected my needs for identity and protection.

When reflecting on abilities and competencies, I perceived several factors as supportive in meeting my needs, such as a high flexibility in the organisation of the workshops, the coordination with workshop participants and the facilitation of the workshops (to meet my need for participation). One very important factor that was linked to other supporting factors was my training as a professional mediator and facilitator. This supported my need for identity and I could profit from various connected abilities such as the ability to create safe spaces and create trust (therefore also supporting me in meeting my need for protection), the ability and capacity for active and deep listening (therefore also supporting me in my need for affection) and the ability to let go, trust and follow the flow of the workshop processes (therefore also supporting my need for idleness). Valuing tacit knowledge (of myself and of other research partners), being open for experimentation and enabling embodied experiences instead of mere intellectual exchanges, all contributed to my needs for creation, participation and affection. Another important aspect was the iterative process of learning – after each workshop, I reflected on the process and adapted future workshop procedures respectively. Progressively learning from experience and feedback of the participants contributed to my needs for creation and understanding.

4.2.4 Human scale

When trying to allocate into groups the most important factors (from Tables 3 and 4) which influenced my research, I framed another category: 'human scale'. I realised that several factors affected me on a very personal level, and thus were maybe less

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'professional.' However, understanding my research as embodied experience, I argue that these factors are worth being explicitly described, especially because most of them were supporting my needs fulfilment and contributed to my motivation of conducting research using the approach that I have chosen.

One aspect negatively affecting my needs for identity and protection was related to gender. In the workshops with the energy cooperatives, I found myself, as young female scholar within a large majority of retired male academics engaged in the energy cooperatives, intimidated as I faced the self-devaluation of presumably not being as intelligent as them. Very similar to this, in the working group on energy at my research institution, disproportionately many (young) men were involved and I had an outsider-role that negatively affected my needs for belonging and creativity.

On the other hand, I had a university supervisor who was very supportive, had an open ear when I needed it and inspired me with new aspects and ideas that I could incorporate. Additionally, I was in contact and exchanged with a small community of other scholars and practitioners who dealt with the HSDA. Within this group, I perceived a lot of sensitive and warm-hearted, supportive interaction amongst each other. This interaction contributed much to my needs for participation, creation, idleness and affection. Also, that I met Manfred Max-Neef in person, in Jena, Germany at a conference and in a side-event workshop that I had organised together with my supervisor, and again later in Chile, and that he interacted with me like a mentor, highly interested and supportive of my work, contributed tremendously to my need for participation and creation.

With respect to the workshops, the cooperation, openness and willingness of the energy cooperative board members and the other responsible actors to promote the workshops, touched me and contributed to the fulfilment of my need for idleness. Additionally, the openness of participants to interact, experiment and get involved in the challenge of reflecting on the basis of their personal needs, and thus their trust in the process, contributed to my need for (deep) understanding. Human encounters made this process special, for example – a deaf-mute woman who otherwise could not participate in workshops because she could not read the lips of others, benefited enormously from a specialised accommodating seating arrangement in the discussion circle and was infinitely grateful for the opportunity to participate and that I had understood her need. Other examples include eating homemade, incredibly delicious currant cake together with participants before a workshop at an energy cooperative and in which I sang a German birthday song for a participant in the Chilean on-site workshop, met my need for affection. Although I often felt the expectations of my role as a scientist, these moments meant that the research participants and I met on a personal level on an equal footing.

Another important supporting factor that I experienced in all of the ten workshops was a moment of special attention, tense euphoria, and above all, closeness when participants engaged in painting pictures of their desired futures. The joy, happiness and a shared sense of hope in the vision phase of the workshop exercise contributed very much to my need for affection.

With respect to power relations, I found it quite difficult for myself to criticise and question supervisors without discrediting someone. It was also remarkable that in undertaking the self-reflexive exercise, I realised, gratefully, that although the weight of the negative factors was heavy, the positive aspects predominated. I undertook this self-reflexive exercise after the entire process was finalised and I argue that it would have supported me tremendously if it would have been a regular event. In the next chapter, I

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will describe factors that I think would have been helpful and supportive to me in earlier stages of my research and would also have made the research process easier altogether. Therefore, I turn the discussion to synergic bridging satisfiers, which can be endogenous and exogenous interventions that would have supported me (and most likely the research team) in the project.

5 Implications of self-reflexive practice for TSc scholars

> "Is it not too late to undertake this self-reflexive practice after the entire process is finalised? During my research project, I often had the idea of using the HSDA within our team. But I wasn't brave enough to meet possible rejection, and the issue did not seem important enough to allocate the necessary amount of time to it. Today, I wish we had reflected more systematically, and asked ourselves more often what it was that made things difficult and what we needed."

5.1 Singular and synergic satisfiers for conducting TSc research

As one of the three objectives of TSc is to achieve educational goals, I derived the following satisfiers from my personal self-reflexive practice, not only as strategies that would have supported me in my research, but also as a proposal for other TSc scholars – students of higher education or more experienced TSc scholars. I would like to make them aware that it is important to have these satisfiers in mind from the beginning, already when designing the research project. I clustered the synergic satisfiers in respect to three dimensions where I perceived most need for action and also the best leverages for change: competencies and inner transformation (as an endogenous dimension, in regarding this, I could have better contributed to my needs fulfilment myself), support and resources (with respect to supervision, as the first exogenous dimension) and structural changes (as the second exogenous dimension).

5.1.1 Competencies and inner transformation

5.1.1.1 Competencies

In hindsight, I realised that I adopted all of the four roles described by Wittmayer and Schäpke (2014) when using the HSDA and that I did not do so consciously. I claim that it would have been helpful to consider in advance of my research project a) whether certain roles were needed for the process and if so, who in the team could take on which role (i.e., reflective scientist, facilitator, change agent and (self-)reflexive scientist), and b) to question which specific competencies were necessary for fulfilling these roles well. This is not a new finding, but confirms what Bulten et al. (2021) previously described. Thus, my experiences go in line with colleagues emphasising the challenges that TSc scholars may face when adopting these different roles, as the competency requirements are very high (Hilger et al., 2018; Bulten et al., 2021). They may be challenged in their identity and self-perception as a researcher due to different internal and external expectations concerning 'new roles' that sometimes conflict with 'traditional' skills (Bulten et al., 2021, p.1279): 'more engaged roles in transdisciplinary sustainability research require new skills and competences that researchers are often not trained in.'

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I claim that the very valuable framework of sustainability competencies, presented in Section 3, should be an integral part of every methods training for students of higher education in the field of sustainability research, as is the case at Leuphana University of Lüneburg, Germany (Barth, 2019), and in trainings for more established researchers. Concerning interpersonal and implementation competencies and change-oriented skills, such as conflict resolution or negotiation abilities [Salgado et al., (2018), p.172], I very much benefitted from my training as a professional mediator.

5.1.1.2 Mind-sets and inner-transformation

> "Self-transformation happens by engaging with critical theories related to sustainability and transformations (head), by reflecting upon one's own normative position as a researcher (heart), by experimenting with methods grounded on one's own values (hands) and by engaging in places as a human being open to developing response-ability (feet)" [Horlings et al., (2020), p.480].

According to Horlings et al. (2020, p.480), self-transformation 'can be a legitimate outcome of [sustainability] research'. I uncovered some of my struggles during my research journey and I have observed how my very personal challenges, experiences and attitudes have influenced my research process and how this process, on the other hand, has triggered the awareness for these topics. For example, my deep self-devaluation and the great pressure to prove, due to the internal classism I experienced, that I am able to carry out high-quality research, was submitted to an internal process of transformation. But the synergic satisfiers for intervention on how to deal with this classism-experience affected two dimensions: a professional coach accompanied me in integrating these issues, as they became visible through my awareness and self-reflexive practice. At the same time, I plea for increased recognition within academia, very similar to upcoming diversity debates (Hunt et al., 2015; Powell, 2018), to also recognise internal and external classism and the deprivations and challenges for people affected by it (Russel, 1996; Agyeman, 2008). But even further, intersectionality with respect to race, class, disabilities, ethnicity, culture, religion or/and gender, needs increased recognition (Rawls and Duck, 2020).

An increasing body of literature highlights the importance and potential of linking individual and collective change and is concerned with this 'inner transformation' (Parodi and Tamm, 2018) or 'personal sustainability' (Horlings, 2015) and may support TSc scholars in acknowledging the complex interrelatedness of the 'inner' and the 'outer' world or even the interbeing (Rauschmayer, 2019; Woiwode et al., 2021).

So-called 'transformative skills', like openness, self-awareness, compassion and empathy, perspective-seeking, empowerment, values-based courage and engagement, all call for greater consideration (Wamsler et al., 2020). I follow the argument that a 'change in mindsets can be supported by changing the way we relate to ourselves, others, the environment, and/or the future' [Wamsler et al., (2020), p.231]; and these dimensions (micro or individual level 'eigenwelt', meso or social group level 'mitwelt', environment or macro level 'umwelt' and future level or future generations 'nachwelt') are exactly the same dimensions within which HSDA invites us to reflect our needs actualisation (Spiering and Barrera, 2021). TSc processes, by providing safe spaces for open dialogue, an atmosphere of trust and co-creation without fear, further such introspections and

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reflections for mindset changes and thus 'link negotiations, interaction and integrated learning' [Wamsler et al., (2020), p.232].

5.1.2 Support and resources

> "Research is usually perceived as an intellectual activity and being trained as a researcher includes reading theory and learning refinements of analyses, but there is little or no formal training in the practical art of actually doing research. Even action research is very much a craft that is learned by doing, and often without any organised supervision." [Heen, (2005), p.272]

Here, I argue for the need of competent and organised supervision for early TSc scholars as a synergic strategy for meeting the needs for understanding and participation within the academic environment. The competencies presented in the previous section hold true for supervisors as researchers as well; but I further argue that PhD students and their supervisors could equally benefit from a more organised supervision of TSc projects. Gordon et al. (2019, p.647) spelled out several leadership qualities of sustainability leaders such as – 'harmonise values and empirical rigour', 'foster equity, shared leadership and consensus', 'cultivate nimbleness and flexibility' or 'persevere and be resilient in the face of substantial pressures'– which provide an environment within which transdisciplinary science may thrive. Developing the necessary leadership skills and attributes requires new, targeted training programmes, mentoring programmes and networks of colleagues. I particularly follow Kläy et al. (2015, p.8) when they argue that there is a need for a 'common will to address meta-level issues of science for sustainable development'; this is where I assume mutual learning is possible.

I consider these competencies to be prerequisites for further efforts to jointly consider which resources are helpful in the research process and how they can be procured.

5.1.3 Structural changes

> "How can critical reflexivity be maintained when performing research that aims to contribute to normative goals such as sustainability? Often too much weight is given to individual responsibility. It's important, but institutions bear a much greater share of responsibility. They are to be held accountable. Sometimes, one gets the impression that academic institutions have become trapped in a fierce competition to obtain funding and high rankings. This leads to a distorted idea of what a university is, and puts their mission of being the voice of reason in society and of transmitting values like societal responsibility to the next generation at risk of being forgotten." [Nowotny, (2018), p.6]

5.1.3.1 Greater recognition of TSc in science and research funding is needed

Milkoreit et al. (2015, p.87) speak of 'conducting science in a hybrid space' and TSc scholars can be seen as 'agents at the boundary between the sphere of science and policy'. They highlight career risks that the practice-orientation may evoke and that they may be

> "negatively framed as 'environmentalists', 'hippies', fervent defenders of social justice, or people who hide ulterior motives behind the protective language of research and objectivity. […] Even without advocating for a specific policy or institutional change, scientists can be attacked by political actors for having non-scientific motives, can be exposed to criticism and misrepresented in the

> media, and as a result lose some of their science-based authority in the process".

Greater recognition of TSc within academia, adapting the procedures related to financing and project duration to the specifics of TSc research, but also different kinds of policy support, could support TSc approaches to get out of the niche (Muhonen et al., 2020; Caniglia et al., 2020; Defila and DiGiulio, 2020).

5.1.3.2 Addressing institutional barriers

Hernandez-Aguilera et al. (2021) as well as Lang and Wiek (2022) stress on the urgency to address institutional barriers, as 'despite strong personal interest, students and early career researchers are often reluctant to engage in this research trajectory' and 'scholars choose 'safer' and better-established career trajectories' [Hernandez-Aguilera et al. (2021), p.374]. Both formulate several very similar actions on how to overcome these barriers, which I would have appreciated to be implemented within my research environment in general (and also within my graduate school, in particular): capacity building in solution-oriented research on all academic levels, changes in the academic reward system to incentivise solution-oriented research, outline of career paths for early career researchers interested in solution-oriented sustainability research including supporting tenure and promotion policies that acknowledge achievements beyond conventional outcomes and publication outlets.

For my internal struggle to find synergic satisfiers on how to meet my need for identity, it was of utmost importance to acknowledge and explicitly spell out the differences and the specific value of the normative positioning as a TSc researcher. Bulten et al. (2021, p.1280) formulate that, on a "more fundamental level, researchers struggle with their normative position. Researchers may feel that committing themselves explicitly to the normative goals of a programme reduces their credibility as neutral and objective providers of knowledge in this particular domain. From a constructivist perspective, however, researchers will never be fully objective, because all scientific practices include normative considerations (Scholz, 2017)". This acknowledgement and the awareness of belonging to a research community is comforting and conveys a sense of security and belonging.

Brundiers et al. (2021, p.22) argue that it would be helpful to spell out 'learning objectives in direct response to widely held prejudices that sustainability science aims to overcome.' They formulate the following as learning objectives for students and I argue they may be used even further as arguments for all TSc scholars to characterise TSc:

> "1 Sustainability is 'not first and foremost about the environment' and not just about technical solutions and engineering; but is instead a layered concept with justice and equity as foundational elements. This would involve broadening the perspective on justice and equity beyond environmental justice to also include more general and explicit forms of social and racial justice.
>
> 2 Integrate values into scientific inquiry, countering the positivistic perception that 'values are outside of the realm of science 'as science' is considered to be objective' and the positivistic instruction that `scientists should not deal in values.'

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3 Articulate sustainability science as a solution-oriented field, which employs the same rigor, using systems-, values-, futures-, and strategic-thinking competencies, to researching solutions to sustainability challenges as to researching sustainability problems.

4 Articulate the necessity of stakeholder engagement (a 'must' have) in sustainability science research (transdisciplinary approaches)."

I think it is not just my own personal experience to have been under high pressure. Of course, my previous experiences aggravated the pressure I felt to master this process well incredibly. Within literature you can find various tips on how to deal psychologically and physically with this pressure (Stock et al., 2014; Auerbach et al., 2018). Is it then not perhaps high time to change this system that makes many PhD students and others so sick? Is it not time to change the underlying values? We as humankind have a huge problem with climate change and dwindling biodiversity – is there not a need for cooperative science instead of competitive science? Is there not a huge need for space to experiment, for failure that is free of judgement, of support structures that allow creative potential to develop?

Table 5 Compilation of supporting factors for TSc scholars

Competencies
• Foreseeing which different roles a research process will require and which competencies/abilities will be needed to fulfil these roles
• Distributing roles according to competencies/abilities
• Integrating the framework of sustainability competencies as an integral part of all methodological training for students of higher education and for sustainability science scholars
Inner transformations
• Acknowledging that personal challenges, experiences and attitudes influence the research process, and, at the same time, that the research process may lead to a self-transformation as a legitimate outcome of TSc processes
• Increasing the recognition of intersectionality within academia (be it with respect to race, class, disabilities, ethnicity, culture, religion and/or gender)
• Linking individual and collective change and acknowledging the complex interrelatedness of the 'inner' and the 'outer' world or even the interbeing (Rauschmayer, 2019; Woiwode et al., 2021)
• Creating safe spaces for open dialogue
Support and resources
• Need for competent and organised supervision for early-career TSc scholars
• Enhancing the leadership qualities needed for sustainability leaders to provide an environment where transdisciplinary science may flourish. This requires new, targeted training programmes, mentoring programmes and networks of colleagues.
Structural changes
• Need for greater recognition of TSc in science and research funding, for the reduction or removal of the career risks facing practice-oriented TSc scholars, for adapted funding schemes and for policy support
• Addressing institutional barriers: need for capacity building in solution-oriented research, changes in reward systems for career paths and achievements beyond conventional outcomes

5.2 Added-value of self-reflexive practice within TSc applying the HSDA

I would like to close this section with a last reflection, and maybe from my perspective, the most powerful result and insight of my research process: an important lever of intervention is the researcher's self-reflexive practice using the HSDA. Following Fazey et al. (2018, p.66), self-reflexive practice may involve the researchers' critical reflecting on how they may need to undergo transformations within themselves to be in a better position to understand or shape transformative change in the systems in which they are embedded. Having applied the HSDA not only during my research in ten workshops, but also using it as tool for self-reflexive practice, I could not only reflect on what factors impeded my needs fulfilment, but I could also see what potentials I already had. This practice helped me to consider not only expected influences, but it additionally made hidden influences visible and I could integrate them. In doing so, I could point out strategies that affected me not only in my different roles as a researcher, but also on a personal and a systemic level (by questioning the academic environment, its cultures and practices). Retrospectively, I would have liked to pass through such a process more regularly and also within a research team. Cruz et al. (2009, p.100) propose such evaluations at different time periods throughout a project, to identify improvements and/or worsening of given dimensions and/or trends. Thus, I do very much promote the HSDA as a valuable tool for self-reflexive practice for students of higher education, PhD students, researchers and research teams on a regular basis.

6 Some concluding remarks

This article has turned out to be an experiment in content and form. I penned this autoethnographic-sensible self-reflexive practice to point out the value of HSDA as a self-reflexive tool for TSc scholars, but also as very personal piece to integrate my experiences during my research journey. Undertaking this self-reflexive practice has been a challenge and an opportunity at the same time – I was able to better understand and integrate my motives for engaging in the normative value-laden TSc research. I understood now that I was triggered by the fact that this kind of research is in its infancy and must assert itself permanently and stand up for its quality, justification and procedures; this was very similar to my personal struggle – and helped me to appreciate my personal journey. I have learned through my research to recognise my own strengths and this has shown me how, through those strengths, if I let them grow within me, other people will trust my abilities and I can take them along, motivate and inspire them. I would be delighted if more HSDA practitioners and TSc scholars could fill in and (jointly) undertake a (self-)reflexive practice of their experiences, applying the HSDA process based on a human scale.

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